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ABSTRACT

This booklet presents a nutrient approach to teaching nutrition. It contains basic nutrition information along with suggestions for translating this information to fulfill the needs of families and individuals. Topics discussed are: (1) a nutrient approach to teaching nutrition; (2) functions of nutrients; (3) how food handling affects nutrient content; (4) nutrients translated into dietary recommendations; (5) what nutrition surveys tell us about U.S. diets; (6) applying nutrient recommendations in everyday food for people; (7) nutrition-wise food buying; (8) cultural and symbolic meanings in food selection; (9) educating the consumer in using nutrition information; and (10) food, nutrition, and health: some issues and controversies. A table is included listing nutrients, their sources in foods, and their major physiological functions. (JD)

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Nutrition Source Book

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Introduction

A new era of awareness about the role of nutrition is unfolding. Unprecedented changes in the world's economy, population, and communications are forcing us to address the food needs of people differently.

New and painful perceptions are being expressed by Americans. What is happening?

World food shortages and global communications bring home the realization that food is a *limited* world resource. In a world with inadequate and unevenly distributed food supplies, food can no longer be regarded as merely a market commodity. People must recognize food as a uniquely life-essential resource, placing human values first in establishing production and distribution priorities.

Inflation, recession, and economic turbulence have rocked nations, large and small. Many Americans felt the sharp pinch of financial anxiety for the first time in their lives during the 1970's. Income can no longer be relied upon to outpace rising living costs.

For those who have suffered loss of employment, the demands of feeding a family during inflation press ever stronger. Food takes on new importance. Extended unemployment is likely to increase the incidence of malnutrition.

Increasing consumer consciousness throughout America is bringing pressure on food producers, food processors, food marketers, and governmental regulatory agencies. Voluntary and mandatory nutrition labeling of foods regulated by the U.S. Food and Drug Administration began July 1, 1975, as an outgrowth of consumer concerns and of recommendations from the 1969 White House Conference on Food, Nutrition and Health.

A rapidly changing, complex blend of forces is propelling Americans into new ways of adjusting and living. This is causing us to examine and re-examine many previously cherished attitudes and values that shape our individual and collective lifestyles. Not the least of these is the significance of nutrition in our lives, which is taking on a compelling new role.

Leaders and teachers involved in various aspects of nutrition education – school and college teachers, consumer and adult educators, health leaders, nutrition counselors, dietitians – are reassessing the problems, issues, and opportunities which they face in meeting coming nutrition needs. The possible passage of proposed Federal legislation requiring nutrition education in schools and health agencies adds even greater urgency to the situation.

This booklet presents a nutrient approach to teaching nutrition. It contains basic nutrition information along with suggestions for translating this information to fulfill the needs of families and individuals.

A Nutrient Approach to Teaching Nutrition

Words such as calorie, vitamin, protein, mineral are now familiar to most Americans. Those involved in nutrition education see evidence of increasing awareness of nutritional terms and topics in their everyday contacts with students, parents, young adults, the poor, the affluent, the sick, and the aging.

This awareness is an essential step toward more effectively solving the nutritional problems many individuals and families face. But now people are beginning to want to know more about nutrients and about specific aspects of nutrition. They want to go beyond the traditional food groups to find out why—and how—to use available nutritional information for the health and well-being of themselves and their families.

To assist nutrition leaders and teachers in planning and conducting programs to meet these demands, a nutrient approach to teaching nutrition is presented here. It is intended for use with adult consumers and students who are motivated to go beyond familiar nutrition fundamentals—to prepare them through knowledge of the fundamentals and sources of nutrients to be more confident and capable in making decisions relating to the choice and use of their food.

Nutrition Concepts

An authoritative design for organizing and developing this nutrient teaching approach is found in the conceptual framework from the 1969 White House Conference on Foods, Nutrition and Health, which follows.

These concepts are quoted as background information only. They are *not* intended to be taught or presented as such; rather, they are the main ideas to be developed through the learner's participation and experiences—through nutrition education.

White House Conference Conceptual Framework for Nutrition Education in the Schools

"**1.** Nutrition is the process by which food and other substances eaten become you. The food we eat enables us to live, to grow, to keep healthy and well, and to get energy for work and play.

2. Food is made up of certain chemical substances that work together and interact with body chemicals to serve the needs of the body.

a. Each nutrient has specific uses in the body.

b. For the healthful individual the nutrients needed by the body are usually available through food.

c. Many kinds and combinations of food can lead to a well-balanced diet.

d. No natural food, by itself, has all the nutrients needed for full growth and health.

3. The way a food is handled influences the amount of nutrients in the food, its safety, appearance, taste, and cost; handling means everything that happens to food while it is being grown, processed, stored, and prepared for eating.

4. All persons, throughout life, have need for about the same nutrients, but in varying amounts.

a. The amounts needed are influenced by age, sex, size, activity, specific conditions of growth, and state of health, altered sometimes by environmental stress.

b. Suggestions for kinds and needed amounts of nutrients are made by scientists who continually revise the suggestions in light of the findings of new research.

c. A daily food guide is helpful in translating the technical information into terms of everyday foods suitable for individuals and families.

5. Food use relates to the cultural, social, economic, and psychological aspects of living as well as to the physiological.
   a. Food is culturally defined.
   b. Food selection is an individual act but it is usually influenced by social and cultural sanctions.
   c. Food can be chosen so as to fulfill physiological needs and at the same time satisfy social, cultural, and psychological wants.
   d. Attitudes toward food are a culmination of many experiences, past and present.
6. The nutrients, singly and in combinations of chemical substances simulating natural foods, are available in the market; these may vary widely in usefulness, safety of use, and economy.
7. Foods play an important role in the physical and psychological health of a society or a nation just as they do for the individual and the family.
   a. The maintenance of good nutrition for large units of society involves many matters of public concern.
   b. Nutrition knowledge and social consciousness enable citizens to participate intelligently in the adoption of public policy affecting the nutrition of people around the world.

Source Book Objectives

This source book was developed for use in a wide variety of nutrition education programs and situations. Its general objectives are:

1. To provide a nutrition reference for use by leaders engaged in either formal or informal nutrition education efforts.
2. To use the White House Conference Conceptual Framework for Nutrition Education as a "springboard" for organizing and developing a nutrient teaching approach adaptable to various audiences and learning situations.
3. To emphasize the functions and sources of nutrients and the scientific basis for dietary recommendations in a teaching approach which complements the continued use of a daily food guide as a practical aid in selecting meals and snacks.

Table 1

What Foods Supply Protein?[1,2]

Food (ready-to-eat)	% U.S. RDA* per serving
35% U.S. RDA or more	
Beef, roast (3 oz, 85 g)	60
Ham, baked (3 oz, 85 g)	60
Tuna, canned in oil (3 oz, 85 g)	60
Beef patty (3 oz, 85 g)	50
Beef liver (3 oz, 85 g)	50
Chicken, broiled (3 oz, 85 g)	45
Cheese, cottage (½ c, 113 g)	35
15% U.S. RDA or more	
Milk, lowfat, 2%† (1 c, 246 g)	25
Milk, skim (1 c, 245 g)	20
Milk, whole (1 c, 244 g)	20
Beans, lima, dry (½ c, 95 g)	17½
Peanut butter (2 tbsp, 32 g)	16
Cheese, cheddar (1 oz, 28 g)	15
Peas, blackeye, dry (½ c, 125 g)	15
Egg (large, 50 g)	15
Frankfurter (2 oz, 56 g)	15
2% U.S. RDA or more	
Bagel (3", 55 g)	10
Cornbread, enriched, Southern-style (2½" x 2½" x 1½", 83 g)	10
Peas, green (½ c, 80 g)	7½
Potato, baked (1 long, 202 g)	6
Noodles, egg, enriched (½ c, 80 g)	5
Oatmeal (½ c, 120 g)	4
Bread, white or whole wheat, enriched (1 sl, 25-28 g)	4
Rice, white, enriched (½ c, 102 g)	3
+ Cornflakes (¾ c, 19 g)	2
+ Tortilla, corn (6", 30 g)	2
Grits, enriched (½ c, 122 g)	2

*See page 17 for definition of U.S. RDA

†with nonfat milk solids added

**Protein contributions of these foods to daily intake become more important when larger servings or more servings are eaten daily, and when combined with animal protein foods.

Sources:

[1]USDA Agr Inf Bull 382, *Nutrition Labeling—Tools for Its Use*.

[2]+National Dairy Council, 1974, *Food Models*, B012A, Rosemont, IL.

Most people are interested in how to be assured that they get the proper nutrients in the amounts needed from daily meals and snacks. They probably recognize the six classes of nutrients—protein, carbohydrate, fat, vitamins, minerals, and water (although it may surprise some to learn that water is considered a nutrient).

Nutrients needed by the body are usually available through food. It is the nutrients in food, not specific foods, which are needed.

Nutrients are important chemical substances that work together and interact with the body chemicals to perform one or more of the following functions:

- Provide materials to build, repair and maintain body tissues.
- Supply substances that function in the regulation of body processes.
- Furnish fuel needed for energy.

The digestive system processes foods into nutrients or nutrient combinations and waste products. Blood carries these nutrients from the digestive system and oxygen from the air we breathe to every cell in the body. Some nutrients need to be replenished every day from the foods eaten, others can be stored in the body for future use.

Nutrients at Work

Each nutrient has certain special jobs to do in the building, maintenance, and operation of the body. These jobs cannot be done by other nutrients—an extra supply of one cannot make up for a shortage of another.

There are other jobs to be done in the body that require nutrients to work together as teams. To build bones, the nutrients vitamin D, calcium, and phosphorus interact. One member of the team cannot perform its job unless all the others are present in the right amounts.

All nutrients are available from food, but they are found in different foods in varying amounts. Many foods play important roles on the nutrition team but no one food can do everything. All of the nutrients most of us need can be obtained by eating a variety of different types of foods.

For centuries, people in different parts of the world have lived on a wide variety of food combinations. Thus, a variety of foodstuffs is known to provide the nutrients that support life, and promote growth and health.

Kinds and amounts of nutrients to meet the needs of nearly all healthy people are recommended by nutrition scientists. They continually revise the recommendations on the basis of new research findings. Dietary recommendations are discussed in a later section which begins on page 16.

Leader Nutrients

Scientists have established that about 50 nutrients are needed by the human body. Ten are considered "leader nutrients"—protein, carbohydrate, fat, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, and iron. If one obtains the proper amounts of the ten leader nutrients in the daily diet, the other 40 or so will likely be consumed in amounts sufficient to meet body needs.

Consumers will find these leader nutrients listed on the information panels of food labels (see "About Nutrition Labeling" on page 33). On the following pages the leader nutrients are presented in the order in which they appear on the "Percentage of U.S. Recommended Daily Allowances" portion of the nutrition information panels of food labels. The section on energy with information about calories, carbohydrate, fat, and protein used for energy follows on page 11.

A convenient chart of leader nutrients, their functions, and sources, is included on page 38. It is a quick, concise reference to aid you in answering questions about the roles and the food sources of nutrients.

Protein

Why We Need Protein

Protein is found throughout the body. Infants and children must have protein to grow. Women must have ample protein during pregnancy and lactation for the proper development and nourishment of their babies.

All through life, protein is required: to maintain and repair body tissues; to make hemoglobin, which carries oxygen to the cells; to form antibodies in the bloodstream that fight off infection and disease; and to produce enzymes and hormones that regulate body processes. Protein may also be used to supply energy.

Table 2

Protein Teams that Work Together

Team Animal Proteins—with Grains:

beef taco
milk breakfast cereal
cheese pizza
cheese sandwich
meat, Oriental vegetables rice
milk rice pudding
tuna rice casserole
cheese macaroni

with Legumes:

cheese bean stew
chili con carne with beans
meat soy analogue
ham split pea soup

with Seeds:

meat Oriental vegetables nuts

Team Plant Proteins—Legumes with Grains:

baked beans brown bread
blackeye peas rice
beans tortilla or cornbread
beans barley soup
dahl (pureed lentil sauce) East Indian rice
lima bean corn (succotash)
beans pasta
peanut butter sandwich
refried beans rice
chickpea puree Syrian bread
soy analogue pasta
peas rice Viennese

Legumes with Seeds:

green beans almonds
peanuts mixed nuts

Some nutrients can be stored in the body, but protein cannot. Each day protein must be supplied by the food you eat. Protein is best used by the body if it is supplied every few hours, in three or more meals or snacks during the day.

Protein is made up of chemical parts called amino acids. There are 22 amino acids. During digestion, proteins from the foods eaten are broken down into amino acids. Then the body reassembles the amino acids into many different proteins, each with distinct characteristics and special functions.

Protein Quality Counts

The kinds and amounts of amino acids in different food proteins affect their quality. The quality of protein in food has some effect on the quantity needed. Of the 22 amino acids, eight are considered indispensable* for human nutrition. They are indispensable because the body cannot synthesize them at all or at a rate sufficient to meet body needs. They must be obtained from food. The eight amino acids indispensable for adults are lysine, tryptophan, phenylalanine, methionine, threonine, leucine, isoleucine, and valine. Another, histidine, is also indispensable for infants.

Depending upon the varying indispensable amino acid content of a protein, its nutritive value, or quality, is high or low. Protein containing the eight indispensable amino acids in proportions and amounts needed by the body has a high-biologic value (supports life). Low-biologic value proteins lack or have too little of one or more indispensable amino acids to support life.

Teamwork of Proteins

Animal proteins—meat, fish, poultry, eggs, milk, and foods made from milk (except butter)—provide readily available indispensable amino acids in usable proportions. These are high quality proteins.

Plant sources of protein—vegetables, fruit, legumes, and grains—are lower in quality than animal sources because certain indispensable amino acids are missing or present in insufficient quantities, or the proportions are not optimal. Soybeans are higher in quality than other plant proteins and approach animal proteins in usefulness in the body.

Fortunately, high quality protein foods can be teamed with lower quality protein foods in the diet to work together nutritionally. For example, cereal grains tend to be low in the amino acid lysine. Milk, a good source of lysine, complements grains. *When eaten together* the indispensable amino acids from the high quality protein make up for the inadequate indispensable amino acids from the lower quality protein making them usable in the body.

Certain lower quality plant protein foods can also be combined to "fill in" the indispensable amino acids missing in each to improve their combined amino acid balance. Legumes (dry beans, peas, lentils, peanuts) tend to be low in the amino acid methionine but are high in lysine; corn is low in lysine but has sufficient methionine to supplement these legumes. Thus, beans and corn eaten together provide good quality protein. A general guide is to combine grains with legumes, seeds with legumes, or any plant protein with a high quality animal protein. The food combinations *should be eaten at the same time* to work together as teams.

Table 2, "Protein Teams that Work Together" is a helpful aid in combining plant or animal protein sources to get balanced amino acid combinations. More complete knowledge of the amino acid composition of plant protein foods is needed to insure the correct balance of indispensable amino acids when combining plant proteins, but the table can help to improve choices of protein combinations.

Vitamins

Probably the most talked-about group of nutrients is vitamins. Most people believe that vitamins are important and good for them. Many also have the notion "if a little is good, more must be better"—a fallacy which can be dangerous when applied to vitamin supplementation.

About fourteen vitamins are known to be needed for health. Recommended amounts have been established for ten. Leader nutrients, among these are vitamins A, C, thiamin, riboflavin, and niacin, are discussed on the following pages. They are also presented in the convenient chart on page 38. Food sources and functions of other essential vitamins are given in the chart "Other Important Nutrients" on page 39.

*In the past commonly called "essential"

Table 3

What Foods Supply Vitamin A?

Food (ready-to-eat)	% U.S. RDA per serving
Beef liver (3 oz. 85 g)	910
Calf liver (3 oz. 85 g)	560
Pork liver (3 oz. 85 g)	250
Carrots, canned (½ c. 78 g)	235
Cantaloupe (½ 5" melon, 477 g)	180
Potato, sweet, baked (1 med. 146 g)	180
Carrots (½ c. 78 g)	165
Spinach, canned (½ c. 103 g)	165
Pumpkin, canned (½ c. 123 g)	155
Potato, sweet, canned (½ c. 110 g)	155
Collards (½ c. 95 g)	150
Peas and carrots (½ c. 80 g)	150
Spinach (½ c. 90 g)	145
Broccoli (med stalk, 180 g)	90
Kale (½ c. 55 g)	90
Turnip greens (½ c. 73 g)	90
Squash, winter (½ c. 73 g)	85
Mustard greens (½ c. 70 g)	80
Beet greens (½ c. 73 g)	75
Carrots, raw (6-8 strips, 28 g)	60
Chicken liver (1 oz. 25 g)	60
Watermelon (4" x 8" wedge, 926 g)	50
Apricots, dried (5, 18 g)	40
Tomatoes (½ c. 121 g)	25

Source
USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use

Vitamins function primarily as catalysts—action regulators—in chemical reactions within the body. Vitamins are essential for the release of energy within the body, for tissue building, and for controlling the body's use of food. By themselves, vitamins do not supply energy (calories) or build tissues. Each vitamin serves one or more special function in the body that no other nutrient can. Deficiencies, too, are specific.

Frequently, vitamins are classified by their solubility in fat or water. The fat-soluble vitamins A, D, E, and K are stored by the body. Water-soluble vitamin C, thiamin, niacin, and riboflavin are not stored to any extent.

Vitamins are measured in extremely small amounts—in milligrams (one-thousandth of a gram) and in micrograms (one-millionth of a gram, 28 grams = one ounce); or in International Units (IU). IU measures the potency: the ability to promote growth or cure a deficiency disease. An inadequacy of a minute amount of a vitamin can have far-reaching effects on body processes and health. Too much of certain vitamins, though seemingly a small amount, can produce harmful toxic conditions.

Why More Isn't Better

To understand why excessive doses of vitamin supplements are potentially harmful, consumers need to know that vitamins are chemical substances which have other chemical activities in the body in addition to vitamin activity. To achieve vitamin activity in the body, the vitamin—acting as part of a *coenzyme*—must associate with a protein—called an *apoenzyme*. Together they form an enzyme known as a *holoenzyme*—which has the vitamin activity in the body.

apoenzyme (special protein) + coenzyme (vitamin) = holoenzyme (active enzyme)

Once the apoenzyme in body cells is saturated—filled up—with the coenzyme (the vitamin), no further activity can possibly be achieved by adding *any* amount of the vitamin. The excess coenzyme then serves as a chemical substance, which in most cases is damaging to the body. This is why overdosages of vitamin supplements cannot benefit the body and may in fact be harmful. As research continues, more answers will be found as to how much is too much.

Holoenzymes are made only within the body. Enzymes consumed are digested, thus lose their enzymatic capabilities and serve no nutritional purpose.

Food—A Reliable Source

Most vitamins need to be provided daily by the foods eaten because the body cannot synthesize vitamins in sufficient amounts. Ordinarily, a well-chosen variety of commonly available foods in daily meals and snacks will provide adequate amounts of essential vitamins.

Consumers may need assurance that supplementary vitamins should be prescribed only for specific medical conditions. The public may also need to be assured that food crops raised using modern agricultural practices do not differ in vitamin contents.

Vitamin A

Why We Need Vitamin A

Vitamin A has an important role in the building of body cells. It is essential for the growth of children and the development of babies before birth. It is needed for bone growth and healthy tooth structure. Vitamin A maintains the normal structure and functioning of the mucous membranes which form the inner linings of the body. It is necessary for normal vision in dim light, and prevents certain eye diseases which could lead to blindness.

Vitamin A occurs primarily in two forms. *Preformed* vitamin A, retinol, is a chemical substance which occurs only in foods of animal origin. It is ready to use as such from foods. Carotene, orange plant pigments, is known as *provitamin A*. It is provided by foods of both plant and animal origin. Carotene is partly converted into retinol, mainly in the intestinal wall, and then is used as vitamin A in the body. Both forms are fat-soluble. Retinol is stored in the liver, carotenes in the body fat. Retinol is in liver, milkfat and egg yolk.

The orange color of foods such as carrots and sweet potatoes is characteristic of carotene. It is also found in deep red food such as plums, but not beets, and in green leafy vegetables.

Table 4

What Foods Supply Vitamin C?

Food (ready-to-eat)	% U.S. RDA per serving
Broccoli (med stalk, 180 g)	270
Cantaloupe (½ 5" melon, 477 g)	150
Collards (½ c, 78 g)	120
Brussels sprouts (½ c, 95 g)	115
Strawberries, froz (½ c, 128 g)	115
Orange juice, froz (½ c, 120 g)	110
Orange juice, canned (½ c, 125 g)	110
Turnip greens (½ c, 73 g)	85
Strawberries, raw (½ c, 75 g)	75
Grapefruit (½ med, 241 g)	70
Grapefruit juice, canned (½ c, 124 g)	70
Lemon (1 lemon, 110 g)	70
Cauliflower, cooked (½ c, 63 g)	60
Mustard greens (½ c, 70 g)	55
Potato, baked (1 med, 150 g)	50
Tomatoes, cooked (½ c, 121 g)	50
Watermelon (4" x 8" wedge, 926 g)	50
Pepper, green (¼ pod, 23 g)	40
Cabbage, shred (½ c, 45 g)	35
Tomatoes, canned (½ c, 121 g)	35
Turnip greens, canned (½ c, 116 g)	35
Asparagus, canned (½ c, 73 g)	30
Okra, sl (½ c, 80 g)	30

Source:
USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use

Table 5

What Foods Supply Thiamin?

Food (ready-to-eat)	% U.S. RDA per serving
Pork loin, lean (3 oz, 85 g)	60
Pork loin chop (2.7 oz, 78 g)	50
Ham, baked, lean (3 oz, 85 g)	35
Beef kidney (3 oz, 85 g)	30
Cereal, ready-to-eat (1 oz, 28 g)	25
Pork spareribs (3 oz, 85 g)	25
Brazil nuts (¼ c, 35 g)	22½
Pork liver (3 oz, 85 g)	20
Bacon, Canadian (1 sl, 21 g)	15
Roll, hard, enriched (1.8 oz, 50 g)	15
Calf beef liver (3 oz, 85 g)	15
Peas, green (½ c, 80 g)	15
Pecans, halves (¼ c, 27 g)	15

Source:
USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use

Carotene is masked by the red and green pigments. The recommendation to eat "dark green, leafy or orange vegetables and fruits" guides you to foods which supply provitamin A.

Too much preformed vitamin A (retinol) can be toxic to both children and adults. Harmful excesses are almost always due to overdosage of vitamin supplements. The Committee on Drugs and the Committee on Nutrition of the American Academy of Pediatrics, in a statement on the use and abuse of vitamin A, recommended that the sale of high potency vitamin A preparations be restricted to prescription.

Introducing 'Retinol Equivalents'

Until recently, vitamin A values of foods have been given as International Units (IU). A new way of expressing biologic activity for this vitamin—the retinol equivalent—is being introduced. One retinol equivalent (RE) is equal to 3.33 IU of vitamin activity from retinol or 10 IU vitamin A activity from B-carotene (a form of carotene). Both IU and RE may be stated.

Vitamin C (Ascorbic Acid)

Why We Need Vitamin C

Vitamin C—ascorbic acid—plays a primary role in the formation and maintenance of collagen, a substance which binds body cells together. Collagen is important for the growth and repair of body tissue cells, for healthy gums and blood vessels, for sound bones and teeth. The body's use of the amino acid tyrosine and of the mineral iron also seems to be related to vitamin C, as does the formation of certain hormones. Recent studies indicate that the use of tobacco and oral contraceptive agents reduce the blood concentration of this vitamin, so users may have increased requirements.

Good food sources of vitamin C need to be eaten each day because water-soluble vitamin C is not stored to any extent. It is eliminated by the kidneys if excessive amounts are consumed. Although vitamin C functions in protecting the body against infections, at present there is insufficient scientific evidence to substantiate reports that *large* intakes of vitamin C are beneficial in preventing common colds. There is evidence that excessive intake produces harmful effects.

Conserve Vitamin C

Vitamin C, the most unstable vitamin, oxidizes—is destroyed—when exposed to air, light, heat, and metals such as copper and iron. Although unstable in an alkaline medium, it is relatively stable in an acid medium. To reduce oxidation and conserve nutritive value, foods high in vitamin C should be used promptly, kept refrigerated or frozen, and cooked quickly in small amounts of liquid or by steaming.

B Complex Vitamins

Vitamin B was first thought to be a single growth substance, but eventually it proved to be not one but several different, though functionally related, growth factors and coenzymes. Of the eleven B vitamins now known, eight are indispensable: thiamin (B_1), riboflavin (B_2), niacin, pyridoxine (B_6), folacin, pantothenic acid, cyanocobalamin (B_{12}) and biotin. Therefore, they must be included in the daily diet.

Thiamin, riboflavin, and niacin, leader nutrients, are discussed separately on the next pages. Others are included in the chart of "Other Important Nutrients" on page 39.

Thiamin* (Vitamin B_1)

Why We Need Thiamin

Thiamin (vitamin B_1) functions in the enzyme system where it plays a key role in the release of energy in the oxidation of carbohydrate. Related roles include: maintaining healthy nerves and mental outlook, normal appetite, good digestion, growth, and muscle tone.

Thiamin is absorbed from the small intestine. Any excess is excreted in the urine because thiamin is water-soluble and is not stored to any degree. It, too, must be replenished daily from food included in daily meals.

Enrichment of cereals, begun in 1941, has added about one-third more thiamin to the American diet. The effect of this enrichment is found in the virtual disappearance of the deficiency disease beriberi in the United States.

Prevent Cooking Losses

Soaking foods such as rice, or draining and discarding cooking liquids, can cause large losses

*In nutrition labeling, the Food and Drug Administration follows the Pharmacopoeia of the United States of America, which spells the word "thiamine" with an "e" on the end. Several professional societies have opted for deleting the "e" as does Dairy Council in its educational materials. It is spelled without the "e" here except in references to its use on nutrition labels.

Table 6

What Foods Supply Riboflavin?

Food (ready-to-eat)	% U.S. RDA per serving
Beef kidney (3 oz. 85 g)	240
Pork liver (3 oz. 85 g)	220
Calf beef liver (3 oz. 85 g)	210
Beef heart (3 oz. 85 g)	60
Chicken liver (1 oz. 28 g)	40
Milk, lowfat, 2% (1 c. 246 g)	30
Milk, whole (1 c. 244 g)	25
Milk, skim (1 c. 245 g)	25
Buttermilk (1 c. 245 g)	25
Yogurt (1 c. 245 g)	25
Braunschweiger (sl. 1 oz. 28 g)	25
Broccoli (med stalk, 180 g)	20
Almonds, whole (¼ c. 36 g)	20
Avocado, Florida (half, 120 g)	20
Lamb, roast, leg (3 oz. 85 g)	15
Chicken, fried (thigh, 65 g)	15
Pork loin chop (2 7 oz. 78 g)	15

Source:
USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use

Table 7

What Foods Supply Niacin?

Food (ready-to-eat)	% U.S. RDA per serving
Pork liver (3 oz. 85 g)	100
Calf beef liver (3 oz. 85 g)	70
Tuna, water pack (3 oz. 85 g)	60
Chicken, roast, breast (3 oz. 85 g)	50
Turkey, roast, breast (3 oz. 85 g)	45
Halibut, broiled (3 oz. 85 g)	35
Mackerel, broiled (3 oz. 85 g)	35
Peanuts, salted (¼ c. 36 g)	30
Pork loin, lean (3 oz. 85 g)	30
Salmon, pink, canned (3 oz. 85 g)	30
Beef steak, lean (3 oz. 85 g)	25
Beef, ground, reg (3 oz. 85 g)	25
Lamb, roast, leg (3 oz. 85 g)	25
Pork loin chop (2 7 oz. 78 g)	25
Veal, loin or cutlet (3 oz. 85 g)	25
Sardines, canned in oil, drained (3 oz. 85 g)	25
Beef roast (3 oz. 85 g)	20
Chicken, thigh (2 3 oz. 65 g)	20
Ham, baked, lean (3 oz. 85 g)	20
Cereals (check label, 1 oz)	20
Peanut butter (2 tbsp. 32 g)	20
Potato, baked (1 long, 202 g)	15

Source:
USDA Agr Inf Bull 382 1975
Nutrition Labeling—Tools for Its Use

of all water-soluble vitamins such as thiamin. It is also destroyed by heat, so foods should be cooked at moderate or low temperatures. Cooking water can sometimes be retained, reserved, or used in sauces, gravies, or soups.

Riboflavin

Why We Need Riboflavin

Riboflavin forms part of several enzymes important in carbohydrate, fat, and protein metabolism. It helps body cells use oxygen. This B vitamin is essential for growth and reproduction; for healthy skin, tongue, mouth, and lips; and for good vision in bright light. It also helps prevent scaly, greasy skin around the mouth and nose.

Riboflavin is absorbed in the small intestine, with any excess excreted in the urine. The greatest concentration of riboflavin occurs in the liver and kidneys, but body reserves are limited. Daily food sources of riboflavin are needed because this too is a water-soluble vitamin which must be replenished at frequent intervals.

Milk is the chief source of riboflavin in the American diet. Useful amounts are also furnished by meats, especially variety meats; eggs; dark green, leafy vegetables; and by whole grain and enriched grain products. Enrichment of cereals with riboflavin has significantly increased the amount of this vitamin available from grain foods in the United States.

Shield Riboflavin from Light

Light and alkalies will inactivate riboflavin in foods, but acids, air, and heat do not affect it. Opaque milk cartons have solved a once-serious problem—the light-destruction of riboflavin in clear glass milk bottles. Because riboflavin is water-soluble, it dissolves in cooking liquids. Conserve it by cooking foods in small amounts of water and by using any drippings or liquids.

Niacin

Why We Need Niacin

Niacin is a constituent of two important coenzymes which assist in the breakdown of sugar to release energy, in fat synthesis, and in tissue respiration. This essential vitamin helps keep the skin, mouth, tongue, and digestive tract in healthy condition. It has a role in the proper functioning of the nervous system. Niacin prevents and cures the deficiency disease pellagra. Niacin is absorbed from the intestinal tract, and any excess is eliminated by the kidneys. Little is stored in the body, so a food source needs to be eaten daily. Niacin is found in the tissues largely as part of the coenzymes. Preformed niacin was first isolated from liver. It includes two chemical compounds—nicotinic acid and nicotinamide.

About Niacin Equivalents

The amino acid tryptophan is a *precursor* of niacin in the body. The body converts tryptophan into niacin. Each 60 milligrams of tryptophan can supply one milligram of niacin. Preformed niacin and niacin activity from tryptophan added together give *niacin equivalents*. However, at the present time there are no precise data showing how much tryptophan is utilized by the body as the amino acid, and how much is converted to niacin. To state the niacin value of foods in the diet without the tryptophan content is incomplete, but it is not presently possible to list niacin equivalent values of foods in any meaningful way. Thus, niacin equivalents are not listed in nutrition labeling or in food composition tables.

Preformed niacin is supplied by liver, lean meats, fish, poultry, whole grain and enriched flour and cereals, peas, beans, peanuts and peanut butter, and potatoes. Cereal enrichment has increased the preformed niacin in the United States food supply by about one-fifth. Important amounts of tryptophan are supplied by milk and eggs. Meats, nuts, and legumes are other sources. Together the food sources of niacin and tryptophan provide a variety of choices which can ensure adequate dietary intake.

Niacin is the most stable of the B vitamins. It is, however, water-soluble, so care is needed in cooking to limit the amount of cooking water and to avoid discarding cooking liquids and meat drippings.

Minerals

A third group of nutrients essential for life is minerals. Daily recommended allowances have been established for six—calcium, phosphorus, iodine, iron, magnesium, and zinc, although about 15 are known to be required for body-building or regulatory functions.

Minerals such as calcium, phosphorus, and magnesium are needed in relatively large amounts. These are known as *macrominerals*,

Table 8

What Foods Supply Calcium?

Food (ready-to-eat)	% U.S. RDA per serving
Milk, lowfat, 2%† (1 c, 246 g)	35
Sardines, with bones (3 oz, 85 g)	35
Milk, whole (1 c, 244 g)	30
Milk, skim (1 c, 245 g)	30
Buttermilk (1 c, 245 g)	30
Cocoa, with milk (1 c, 250 g)	30
Yogurt, plain, part skim milk (1 c, 245 g)	30
Yogurt, plain, whole milk (1 c, 245 g)	25
Cheese, Swiss (1 oz, 28 g)	25
Cheese, American process (1 oz, 28 g)	20
Cheese, Cheddar (1 oz, 28 g)	20
Salmon, red, with bones (3 oz, 85 g)	20
Collards (½ c, 95 g)	17½
Farina, enriched instant (¾ c, 184 g)	15
Salmon, pink, with bones (3 oz, 85 g)	15

†with nonfat milk solids added

Source:
USDA Agr Inf Bull 382.
Nutrition Labeling—Tools for Its Use.

which are required by the body in amounts *more than* 100 milligrams each day. *Micro-minerals,* or trace elements, are those needed in smaller amounts of *less than* 100 milligrams a day. These include iodine, iron, and zinc.

Like vitamins, minerals do not supply calories. They are not broken down in the digestive processes but are partly absorbed if soluble, for use in about the same forms as they occur in foods.

Minerals, except iron, are not used up in the body but are excreted after carrying out their particular body functions. Losses, therefore, must be regularly replaced by foods eaten. Iron is both reused and stored. See page 11.

Calcium and iron are two indispensable minerals most likely to be lacking in the diets of many Americans. Calcium is most readily available in milk and milk products, but several different sources of iron are needed to meet allowances. Most of the other minerals are widely available in many different foods, so a diet containing a variety of foods which supplies the ten leader nutrients is likely to supply enough minerals, except for iron. For concise information about the functions and food sources of these and other minerals, see the nutrient charts on pages 38, 39.

Calcium

Why We Need Calcium

All people need calcium throughout life. Pregnant and lactating women, teenagers and growing children have the highest calcium needs. Nearly all of the two to three pounds of the body's calcium is found in the bones and teeth.

Calcium, united with other minerals, is deposited in and around the organic matrix (framework) of bones to give structure and strength (calcification). Once bone is formed, new bone cells continue to be built and old bones to be broken down at the same time. About 20 percent of adult bone calcium is reabsorbed and replaced annually; therefore, a calcium deficiency during adult years results in decreased bone density.

Calcium is deposited in the keratin of developing teeth, giving them rigidity and permanence. Teeth, unlike bones, cannot repair themselves.

In general, the body adapts to varying calcium intake by regulating its absorption. A major factor affecting calcium absorption is the presence of sufficient vitamin D-active compounds. These may be supplied in the diet or from exposure to the sun or to ultra-violet radiation, which activates 7-dehydrocholesterol (a derivative of cholesterol), provitamin D, in the skin.

Teamwork of Calcium and Other Nutrients

As noted, vitamin D is extremely important in the absorption of calcium in the intestinal tract. Calcium teams up with phosphorus to give bones and teeth strength and hardness. It works with sodium and potassium for a normal heartbeat. Fluoride, incorporated in the mineral structure of bones and teeth, increases resistance to tooth decay. Although the metabolism of calcium is known to be linked with nutrients other than vitamin D, the mechanisms are not fully understood.

The ratio of calcium to phosphorus in milk is about the same as in the human skeleton. Research continues on the effects of the amount of phosphorus and the dietary ratio of calcium to phosphorus on calcium utilization to understand the impact of the marked increase in dietary phosphorus from large intakes of soft drinks and meat in the United States.

Limited data suggest that fluoride may reduce decalcification of bone in osteoporosis—a condition most frequently found in older people, especially women, in which bones become fragile due to withdrawal of calcium.

Milk sugar, lactose, has been found to enhance calcium absorption from the intestine.

The small amount—about 10 grams—of calcium in the body tissues and fluids has important roles in controlling transmission of nerve impulses, contraction of muscles, clotting of blood, functioning of the myocardium (middle muscle layer of the heart wall), regulation of passage of fluids through cell walls, and activation of enzymes.

Iron

Why We Need Iron

Most of the body's three to five grams of iron is present in the blood. Most of the iron absorbed in the intestinal tract is transported to the bone marrow, where it combines with protein to make hemoglobin, the red substance in red blood cells (erythrocytes).

As blood flows through the lungs, hemoglobin combines with oxygen, goes to the tissues, releases the oxygen for energy uses, and carries

Table 6

What Foods Supply Iron?

Food (ready-to-eat)	% U.S. RDA per serving
Pork liver (3 oz. 85 g)	140
*"Cereal" 100% fortified (1 oz. 28 g)	100
Calf liver (3 oz. 85 g)	70
Beef kidney (3 oz. 85 g)	60
Farina, enriched, instant (½ c. 122g)	45
Beef liver (3 oz. 85 g)	40
Clams, raw (4-7 clams, 70 g)	30
Beef heart (3 oz. 85 g)	30
Peaches, dried (½ c. 80 g)	30
Prune juice (½ c. 128 g)	30
• Bran flakes with raisins (1 oz. 28 g)	25
• Bran flakes, 40% bran (1 oz. 28 g)	25
Beef pot roast, lean (3 oz. 85 g)	20
Beef flank steak (3 oz. 85 g)	20
Beef sirloin steak (3 oz. 85 g)	20
Molasses, blackstrap (1 tbsp. 20 g)	20
Pork loin, lean (3 oz. 85 g)	20
Beans, navy, dry (½ c. 95 g)	15
Beans, white, dry (½ c. 128 g)	15
Beef steak, broiled, lean (3 oz. 85 g)	15
Ham, baked, lean (3 oz. 85 g)	15
Beef, ground, reg (3 oz. 85 g)	15
Prunes, dried (10 prunes, 75 g)	15
Syrup, sorghum (1 tbsp. 21 g)	15

*Two servings weekly is usually sufficient to raise the iron content of a varied, adequate diet to the recommended amount. Daily use of 100 percent iron-fortified cereals that also contain 100 percent of vitamins A and D is not recommended when additional vitamin-fortified foods are also eaten daily for a prolonged time. The excessive fat-soluble vitamins will be stored in the body, and may accumulate to a level that can produce adverse effects.

Source:
USDA Agr Inf Bull 382
Nutrition Labeling – Tools for its Use
• Package labels, four brands

carbon dioxide back to the lungs to be exhaled. Iron is essential to the oxygen-carrying ability of hemoglobin.

Iron is also an essential constituent of certain enzymes. Copper is interrelated to the normal absorption of iron and to the formation of certain iron-containing enzymes and hemoglobin. The B vitamins B_{12} and folacin have important functions related to iron in the prevention of anemias.

Conservation of Iron

Iron is not broken down or used up in the body. Instead, the body tends to conserve and reuse iron to a remarkable extent. An erythrocyte (red blood cell) is formed with iron in the bone marrow, lives about 120 days, dies, and breaks down in the spleen, after which the iron is salvaged and used again. Iron is stored in relatively large amounts in the liver, spleen, and bone marrow.

Loss of blood is the only way any significant amount of iron can leave the body. For this reason, people who have periodic blood losses or who are forming new blood have the greatest need for dietary iron. Those having the highest iron needs include women of child-bearing age, pregnant women, and growing children. These groups are also most likely to suffer from iron-deficiency anemia.

The amount of iron recommended for women of child-bearing age is not met by the typical American diet, especially when the diet does not contain large amounts of red meat. It is possible to increase iron intake by selecting iron-rich foods and foods that increase the absorption of iron such as meat and citrus fruit. Proposed increases in iron enrichment of foods can be expected to increase iron intake if adopted.

The body's needs for iron are met with iron salvaged from the breakdown of hemoglobin, from body stores, and from dietary sources – food. Recommendations for iron consumption are estimated by determining how much dietary iron, at an assumed 10 percent absorption rate, is needed to replace body loss.

All forms of dietary iron are not equally available for absorption in the body. Although both inorganic and organic iron (hemoglobin in meat) can be utilized, that in animal foods is better absorbed. The availability of iron from plant foods is enhanced by eating them with meat. Vitamin C also increases absorption. Iron's availability may be reduced somewhat by phosphoproteins in eggs and by phytates in unleavened whole wheat. A toxic level of iron is extremely rare in the United States in healthy individuals. However, excessive dosages of iron-fortified vitamins or medicinal iron compounds are a serious hazard, particularly for children. Iron poisoning from such sources is increasing nationally and can be fatal or cause permanent injury to the intestinal tract if a large amount is taken accidentally. CAUTION: Parents should be warned of leaving iron-containing supplements in places accessible to children.

Energy

Energy is the body's most basic need. Energy is used for breathing, when the heart pumps blood, when we sit, stand, and walk. The more vigorous the exercise, the more energy is required. Energy needs vary with the individual's weight, growth state, and activity.

The energy value of any food is measured in units called joules (metric system) or in kilocalories, commonly shortened to "calories" in the United States. Nearly all foods supply energy – calories – but some more than others. No single food or kind of food is "fattening" by itself. When the energy provided in food is not used, the excess is stored in the body in the form of fat. Storage of too many excess calories results in overweight.

Calories are not nutrients – the nutrient sources of calories are: protein, carbohydrate, and fat. Equal amounts of these nutrients differ in the amount of energy released in the body:

- **1 gram of protein** = **4 Calories**/17 Joules
- **1 gram of carbohydrate** = **4 Calories**/17 Joules
- **1 gram of fat** = **9 Calories**/38 Joules

Calories may also be added to food intake by consuming alcoholic beverages, which supply no nutrients but yield calories at the rate of 7 Calories/30 Joules per gram of alcohol.

When calories eaten are equal to the calories used for energy, caloric balance is achieved, and body weight is stable. However, caloric balance does not ensure adequate intake of essential nutrients. Counting calories to obtain caloric balance is not enough – it is necessary to "count nutrients" too.

Choose Nutrient-Plus Foods

Along with calories, it is important to evaluate foods for the kinds and amounts of nutrients

Table 10

Food Sources of Cholesterol

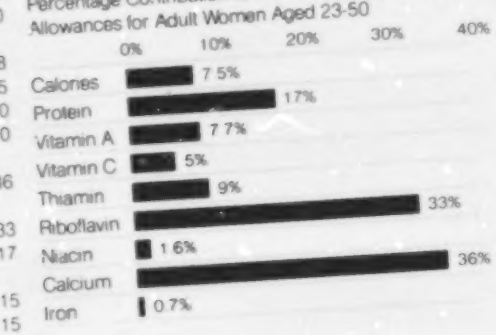
	Cholesterol (mg)
Meat, Fish, Poultry, Eggs	
(Average serving after cooking)	
Liver (3 oz. 85 g)	372
Egg (1 large, 50 g)	274
Shrimp, canned, solids (3 oz. 85 g)	128
Veal (3 oz. 85 g)	86
Lamb (3 oz. 85 g)	83
Beef (3 oz. 85 g)	80
Pork (3 oz. 85 g)	76
Lobster (3 oz. 85 g)	72
Chicken, breast (½ breast, 80 g)	63
Clams, canned, solids (½ c. 80 g)	50
Chicken, drumstick (1, 43 g)	39
Oysters, canned (3 oz. 85 g)	38
Fish, fillet (3 oz. 85 g)	34-75
Desserts	
(Average serving)	
Ladyfingers (4, 44 g)	157
Custard (½ c. 133 g)	139
Pie, apple (⅛ of 9" pie, 144 g)	120
Pie, custard (⅛ of 9" pie, 114 g)	120
Pie, lemon meringue (⅛ of 9" pie, 105 g)	98
Pudding, raisin bread (½ c. 133 g)	85
Pie, peach (⅛ of 9" pie, 114 g)	70
Pie, pumpkin (⅛ of 9" pie, 144 g)	70
Cake, yellow, from mix (⅛ of 9" cake, 75 g)	36
Cake, chocolate, from mix (⅛ of 9" cake, 69 g)	33
Brownie, homemade (1, 20 g)	17
Pudding, chocolate, made from mix (½ c. 130 g)	15
Pudding, raisin rice (½ c. 133 g)	15
Dairy Foods	
(Average serving)	
Milk, whole (1 c. 244 g)	33
Ice cream (½ c. ¼ pt. 67 g)	29½
Yogurt, plain or vanilla (1 c. 227 g)	29
Cheese, American process (1 oz. 28 g)	27
Cheese, Swiss (1 oz. 28 g)	26
Cream, whipping, heavy (1 tbsp. 15 g)	21
Milk, lowfat, 2% (1 c. 246 g)	18
Cheese, cream (1 tbsp. 14 g)	16
Butter (1 pat, 1 tsp. 5 g)	11
Buttermilk (1 c. 245 g)	9
Half-and-Half (1 tbsp. 15 g)	6
Cream, sour (1 tbsp. 12 g)	5
Cheese, cottage (½ c. 100 g)	5-15½
Milk, skim (1 c. 245 g)	4

they supply. Foods with greater amounts of nutrients in proportion to calories may be considered *nutrient-plus* foods. Those with limited nutrient content and higher calorie values are *nutrient-limited* foods. To meet daily nutrient recommendations, foods should be chosen *first* from the nutrient-plus foods. Then, if calories permit, additional foods may include some nutrient-limited foods as desired. For some groups or individuals, the terms "nutrient-plus" and "nutrient-limited" foods may be helpful in understanding the concept of nutrient density – a nutrient to calorie ratio.

The graphs below illustrate the nutrient: calorie ratio in a high-nutrient-density food – milk, and in a low-nutrient-density food – soft drink.

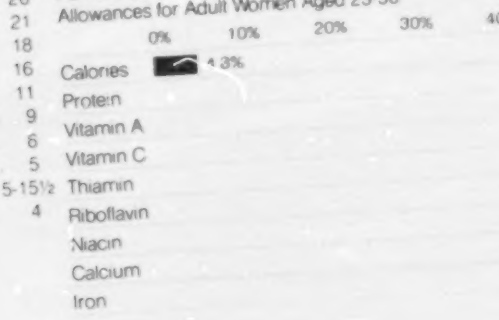
Food with High-Nutrient Density

Milk, whole, fortified with vitamin D
1 cup (237 ml)



Food with Low-Nutrient Density

Soft Drink, cola
1 cup (237 ml)



One cup of milk supplies 36 percent of the calcium, 33 percent of the riboflavin, and 17 percent of the protein in 7.5 percent of the calories recommended for women from 23 to 50 years of age. Smaller percentages of thiamin, vitamins A and C, and iron are also supplied by milk. (The niacin value shown does not include tryptophan, the precursor of niacin, which is present in significant amounts).

In contrast, the second graph shows that a soft drink, a low-nutrient-density food, supplies calories from carbohydrate without supplying any other leader nutrients.

The variety and amount of nutrients per calorie in a high-nutrient-density food exceeds that found in low-nutrient-density foods in which calories predominate. This way of "counting nutrients" along with calories is a sound way to achieve caloric balance while providing the essential nutrients for optimum health.

Fat

Why We Need Fat

Fat is a concentrated dietary source of energy. It supplies an indispensable (essential) fatty acid and carries vitamins A, D, E, and K. Fat helps the body use protein and carbohydrate more efficiently. It is a component of cell walls. Deposits of fat in the body serve to support and cushion vital organs, and to provide insulation.

The most common forms of fat in foods and in the body are known chemically as triglycerides. Triglycerides are made up of three molecules of fatty acids and one molecule of glycerol, an alcohol. During digestion, dietary fats are broken down into fatty acids and glycerol.

Fatty acids play a role in the regulation of tissue and cholesterol metabolism, and as precursors of prostaglandins – hormone-like regulatory compounds. One, linoleic acid, is indispensable for life. The body cannot make its own linoleic acid, so it must be obtained from foods. The best source of linoleic acid is vegetable oils, except olive and coconut oils. One or two percent of total calories from foods containing linoleic acid will provide needed amounts of this indispensable fatty acid.

Body cells, except for red blood cells and those of the central nervous system, can utilize fatty acids directly as a source of energy. Any not used are stored as triglycerides in the adipose (fat) tissue as a reserve supply of energy.

About Dietary Fat and Cholesterol

Questions frequently asked concern saturated and unsaturated fatty acids. Saturated fatty acids are usually solid at room temperature. Higher

Table 11

What Foods Supply Carbohydrate?

Sugars and Starches (No U.S. RDA for carbohydrate)	Percentage by Weight
Sugar, granulated	99.5
Candy, hard	97.2
Sugar, brown	96.4
Rice, puffed	89.5
Cornflakes	85.3
Honey	82.5
Raisins	77.4
Popcorn	76.7
Flour	76.1
Fudge, chocolate	75.0
Cookie, sugar	68.0
Syrup, maple	65.0
Cake, angel food	60.2
Bread, white, enriched	50.5
Bread, whole wheat	47.7
Pie, apple	38.0
Rice, cooked	24.2
Banana	22.2
Potato, baked	21.1

proportions of saturated fatty acids are found in foods from animal sources and in some vegetable fats such as coconut oil. Unsaturated fatty acids are usually liquid at room temperature. Higher proportions of unsaturated fatty acids are found mostly in vegetable fats. Highly unsaturated fats are called polyunsaturated fats. Saturated fats tend to raise the blood cholesterol level in some people, while increased use of polyunsaturated fats tends to lower the blood cholesterol level in some people.

In addition to triglycerides, food fats contain phospholipids and sterols. One sterol, *cholesterol*, is a fatlike substance found in blood, brain, and nervous systems. It is not a "foreign substance" but is essential to the structure of every cell in the body. Cholesterol is related to vitamin D and the steroid hormones. Steroid hormones made from cholesterol include cortisone and sex hormones. About 1000 mg cholesterol are synthesized by the body per day. Some "Food Sources of Cholesterol" are listed in Table 10.

Cholesterol is one of the constituents of atheroma, the deposits in the arteries which may lead to arteriosclerosis or heart disease. A raised level of cholesterol in the blood is one of several risk factors associated with heart disease. However, there is no evidence which points conclusively to a need for *radical* dietary change for *everyone*. There is danger of omitting essential nutrients when any type of food is eliminated entirely.

While research continues in the areas of diet and its possible relationship to heart disease, it is well to caution individuals against drastic diet changes. A well-balanced diet chosen from a variety of foods can include moderate amounts of fat, both saturated and unsaturated. This recommendation is appropriate for all family members to follow *unless a physician prescribes otherwise*.

There is no specific daily recommendation for dietary fat. However, many medical researchers recommend a reduction from the usual 40 to 45 percent of total calories from fat in American diets to no more than 35 percent.

What Foods Supply Fat?

The foods with fat we can see – visible fat – include: cooking fats and oils, salad oils, butter, margarine, and the fat on meat. About one-half the total dietary fat comes from foods with "invisible fat." These include: lean meat, nuts, eggs, some dairy products, baked goods (such as cakes, cookies, pies), fried and deep-fat fried foods (doughnuts, potato chips, meats, vegetables), chocolate, olives, avocados, mayonnaise and salad dressings, gravies, and frostings and sauces made with fat. Nutrition information panels on food labels give the amount of fat per serving. See page 33 About Nutrition Labeling.

Carbohydrate

Why We Need Carbohydrate

Sugars and starches are the principal kinds of carbohydrate. Sugars, except lactose in milk, are found in plant juices and fruits. Starch is the chief carbohydrate in seeds, tubers, and roots.

Starches are just complex forms of sugar. Both starches and sugars are broken down by digestion into the "blood sugar" glucose. Glucose is one of the body's most important fuels. It is the main source of energy for the red blood cells and the central nervous system, an important reason for including food sources of carbohydrate in the diet. Glucose is used for energy or is stored in the liver and muscles as glycogen, a starchlike substance also known as animal starch.

Carbohydrate spares protein from being used for energy, freeing it for important functions such as tissue growth and repair. Carbohydrate also aids in fat utilization. Lactose (milk sugar) increases absorption of calcium and phosphorus, and promotes growth of beneficial bacteria which synthesize certain vitamins in the intestinal tract.

Americans get about half of their calories from carbohydrate. There is no definitive requirement for carbohydrate. Carbohydrate can be synthesized from amino acids and glycerol. However, it is desirable to provide from 50 to 100 grams of dietary carbohydrate daily to avoid ketosis, an acid condition of the blood which may occur when fat is used primarily for energy.

About Sugar

Sugar adds flavor to many foods and yields energy in the body. However, foods high in the sugar sucrose frequently have low-nutrient density – they are generally high in calories and low in leader nutrients. They tend to dull the appetite and promote tooth decay. These foods, therefore, should be eaten in moderation.

Table 12

What Foods Supply Fiber?

(No U.S. RDA—Fiber is not a separate nutrient, but rather types of complex carbohydrates)

Whole grain and bran breads, cereals, flour

Legumes—dry beans and peas, green beans, green peas, lentils, lima beans, peanuts with skins, snow peas

Nuts, popcorn, seeds

Fruit and vegetables with edible skins and seeds—apples, asparagus, blueberries, broccoli, cabbage, cauliflower, celery, corn, cucumbers, grapes, plums, potatoes, prunes, raisins, raspberries, summer squash, tomatoes

Root vegetables—beets, carrots, sweet potatoes, turnips

About Starches

A common misconception is that the carbohydrate foods – starches, particularly – are more fattening than other foods. However, a gram of carbohydrate yields energy at the same rate as protein – 4 Calories per gram, whereas fat yields 9 Calories per gram. A reduction in carbohydrate in the diet generally results in eating more fat – a misguided approach to reducing caloric intake.

About Dietary Fiber

Dietary fiber, the hard, woody, or stiff substances in plants that support, coat, or protect plant cells, is composed of complex, carbohydrate compounds (also called roughage). Fiber is largely indigestible as it passes through the food tract. It is not a separate nutrient since it is carbohydrate, but its presence in the intestines has beneficial effects.

Fiber promotes regular elimination by making the unabsorbed food products in the intestines bulkier and softer, which helps to hasten their passage through the intestinal tract. This aids in regularity and also seems to increase elimination of bile acids, sterols, and fat. Fiber may have other functions, which are being studied by scientists.

Because American diets have tended to provide decreasing amounts of fiber, it seems advisable to recommend eating some additional fiber. Food sources are listed in Table 12.

Water

Why We Need Water

Water is an important nutrient, essential for life. Although people have not generally regarded it as a nutrient, it is. It accounts for one-half to three-fourths of the body's weight. Water serves as a building material, a solvent, and a regulator of body temperature. It carries nutrients to cells and waste products away. It aids digestion and is necessary in all chemical reactions in metabolism.

Daily water losses need to be replaced. Dietary sources of water include not only beverages but also that in foods. The many factors determining body water loss preclude setting a recommendation for minimal water intake.

Food Handling Affects Nutrient Content

From its place of origin to the table, the way food is handled affects its palatability, safety, quality, and nutrient content.

Producing Food

American agriculture has an unequaled capacity to produce reliable supplies of wholesome, safe, plant and animal food products, as seen by the year-round availability of fresh, frozen, canned, and dried foods in U.S. markets. Although much is known, research continues to seek ways to increase food yields, improve nutrient content, and protect the quality and safety of agricultural food products.

Research has not shown a direct relationship between the *vitamins* in foods and the chemical composition of soils in which they grow, although there is some effect on *mineral* content. The use of agricultural chemicals is rigidly and effectively controlled by Federal legislation. When pesticides have been correctly used according to directions, no known harm has been caused to humans. See "Organic Foods" on page 36.

Processing Food

The purpose of processing food is to prepare and preserve it for human use. (See "Food Additives" on page 35.) Processing has little effect on the minerals in foods. Vitamins, though susceptible to partial destruction from heat, light, oxidation, and other chemical reactions during processing, are not significantly reduced in our food supply by processing. Most fresh foods have a very short shelf life and lose vitamins rapidly if improperly stored. During grain processing, nutrients are lost. The B vitamins and iron are frequently "restored"—added to the level present in the grain before processing. Nutrient content can also be enhanced during processing by "enrichment"—adding vitamin(s), mineral(s), or protein(s) which are naturally present in lesser amounts—or by "fortification"—adding vitamin(s), mineral(s), or protein(s) which are not naturally present. Milk may be fortified with vitamin D, skim milk with vitamins A and D, table salt with iodine, and so on.

Moving and Storing Food

Essential links in the movement of food from producers to consumers include mechanical refrigeration, a nationwide transportation system, and storage facilities along the way. Modern technology provides the means to protect and preserve our food all along the food chain. Consumers cannot control how food is handled before purchase, but they can reject buying foods with any signs of poor quality, contamination, spoilage, or careless handling.

How consumers handle food *after it is purchased* is equally important. They can:

1. Shop last for perishable and frozen foods, and take them home at once.
2. Store foods right away. Put frozen foods in freezer first. Refrigerate: fresh milk and all dairy foods, eggs, meat, poultry, fish, seafood; foods made with whipped cream, custard, or mayonnaise; fresh, fully ripened fruits and fresh vegetables.

Preparing Food

To conserve nutrients:

1. Prepare raw or cooked vegetables close to serving time.
2. Wash produce quickly without soaking.
3. Keep chopping and peeling to a minimum.
4. Cook vegetables tightly covered in small amount of water, until just tender.
5. Save cooking liquids for sauces and soups.
6. In general, cook high-protein foods—meat, poultry, eggs, cheese—at low or moderate temperatures. Use meat drippings to flavor vegetables, soups, and sauces.

Preventing Food-Borne Illnesses

Proper food handling is the primary protection against a major hazard in every home, that of "food poisoning" caused by various kinds of harmful bacteria or by harmful toxins given off by certain bacteria. Some guidelines are:

1. **Hygiene**—Wash hands thoroughly with hot soapy water before handling food and after each handling of uncooked foods, especially raw poultry.
2. **Sanitize**—After preparing meat on a cutting board, wash the board with hot soapy water.
3. **Temperatures**—Keep frozen foods frozen: thaw them in refrigerator (or poultry in cold running water). Refrigerate foods at under 4.4° C (40° F). Remove foods from refrigerator just before use, and return leftovers promptly. Do not let frozen, chilled, or cooked foods stand at room temperatures (if left out several hours, discard). Serve hot foods at once or hold above 60° C (140° F). Do not serve undercooked pork or meat mixtures. For home canning, follow reliable instructions exactly for processing time and temperature.
4. **Tasting**—CAUTION: Never taste or serve any amount of a spoiled or even questionable food. Throw it *all* away.

Scientists Translate Nutrients into Dietary Recommendations

At the onset of World War II, U.S. governmental leaders became concerned about safeguarding public health by providing adequate supplies of critical nutrients. To address such problems, the Food and Nutrition Board of the National Research Council of the Academy of Sciences was established in 1941.

Recommended Dietary Allowances (RDA)

Safeguard Public Health

A primary need was for a nutritional standard to use in measuring nutritional needs of *groups* of people. The Board developed the first Recommended Dietary Allowances – RDA – *to meet the needs of almost every healthy person*, on the basis of available scientific knowledge.

Since the first RDA were published in 1941, they have been revised about every four to six years by eminent scientists serving on the Food and Nutrition Board. These periodic revisions incorporate new research findings via an extensive process of reviewing and revising estimates of human needs for every nutrient included.

The 1941 RDA listed calories and nine nutrients for 17 age/sex categories. Several additions of data were included in subsequent revisions. The latest revision, published in 1980 (see page 19) includes calories and 17 nutrients for 15 age/weight/sex categories, plus additional categories for pregnancy and lactation.

From the original national defense purpose, the use of the RDA has expanded. The "Recommended Dietary Allowances" or "RDA" has become a familiar and highly respected term to persons in the nutrition field. The RDA serves as a guide: "... for planning and procuring food supplies for population groups; for interpreting food consumption records; for establishing standards for public assistance programs; for evaluating the adequacy of food supplies in meeting national nutritional needs; for developing nutrition education programs; for the development of new products by industry; and for establishing guidelines for nutritional labeling."*

How well the meaning and purposes of the RDA are understood affects their use. This concern prompted the Food and Nutrition Board to include a special explanatory section in the 1980 edition of the RDA. It discusses procedures used in developing allowances and precautions to observe in using the RDA. Some implications are considered in the following section under "The RDA."

Measurements Used in the RDA

Scientists have made extensive use of the metric system of measurement for many years. This is the system used for most nutrients in the RDA table shown on page 18. Nutrients are measured in very small amounts – by weight:

1 ounce	equals	28 grams	(g)
1 gram	equals	1000 milligrams	(mg)
1 milligram	equals	1000 micrograms	(µg. or mcg)

Implications for Using the RDA*

In defining the RDA as "levels of intake of essential nutrients considered ... on the basis of available scientific knowledge ... to be adequate to meet the known nutritional needs of practically all healthy persons," several implications should be considered.

1. RDA are recommendations for amounts of nutrients which should be consumed – that is, nutrients actually eaten, making no allowance for amounts lost during processing or preparing foods.
2. RDA are recommendations for maintaining health, but do not cover special needs due to illness.
3. RDA are estimates of known physiological nutritional needs to ensure a satisfactory rate of growth of children and maintenance of weight and prevention of nutrient depletion of adults. They are not meant to be optimal or ideal intakes, nor recommendations for an ideal diet.
4. RDA are public health recommendations designed as guides for safeguarding public health. They are not average requirements but *recommendations* intended to meet the physiological needs of almost every healthy person. To meet the needs of those with the highest requirements, RDA will exceed most people's requirements.

   Persons consuming less than the RDA are not necessarily consuming an inadequate diet. Yet, as increasing proportions of people

*Hegsted, D.M. 1972. "Problems in the use and interpretation of the Recommended Dietary Allowances." *Ecology of Food and Nutrition* 1:255-265. (As quoted in National Academy of Sciences. Eighth Edition 1974. Recommended Dietary Allowances (1-2) Washington, D.C.)

*Adapted from an article by Alfred E. Harper, Ph.D., Chairman, Food and Nutrition Board (NAS-NRC) Committee on Recommended Dietary Allowances 1974. "The New Recommended Dietary Allowances." *Nutrition News* 37.5 Rosemont, IL: National Dairy Council.

Table 13

U.S. Recommended Daily Allowances (U.S. RDA)

	Adults and Children (four years and over)	
Protein *		
Protein quality equal to or greater than casein	45	g
Protein quality less than casein	65	g
Vitamin A *	5 000	IU
Vitamin C (ascorbic acid) *	60	mg
Thiamine (vitamin B_1) *	1 5	mg
Riboflavin (vitamin B_2) *	1 7	mg
Niacin *	20	mg
Calcium *	1 0	g
Iron *	18	mg
Vitamin D	400	IU
Vitamin E	30	IU
Vitamin B_6	2 0	mg
Folic acid (folacin)	0 4	mg
Vitamin B_{12}	6	µg
Phosphorus	1 0	g
Iodine	150	µg
Magnesium	400	mg
Zinc	15	mg
Copper	2	mg
Biotin	0 3	mg
Pantothenic acid	10	mg

*These nutrients *must* appear on nutrition labels. The other nutrients *may* appear.

in a population consume less than the RDA, the probability increases that some consume inadequate diets. A person who consumes nutrients in amounts equal to or greater than the RDA is likely to consume an adequate diet.

5. Recommendations for energy differ from allowances for specific nutrients. Recommended energy allowances are *estimates of average needs of population groups* – not recommended intakes for individuals. The different treatment of energy recommendations is due to the individual nature of energy needs and energy consumption, and the detrimental effects of prolonged excessive energy intakes and resulting obesity.

U.S. Recommended Daily Allowances (U.S. RDA)

U.S. RDA New Standards for Food Labels

The United States Recommended Daily Allowances were devised by the Food and Drug Administration to be used as the legal standards for labeling foods in regard to nutrient content. They should not be confused with the RDA.

The use of the U.S. RDA in nutrition labeling became effective June 30, 1975. These standards were developed, after years of study, to provide consumers with reliable information about the nutrient content of the foods they buy, as recommended by the White House Conference on Food, Nutrition and Health.

The 1968 RDA were used as the basis for developing the U.S. RDA. The U.S. RDA condenses the 26 age/sex categories of the 1968 RDA into only four, because there isn't room on food labels for all the RDA. The four categories – infants, children under four years, adults and children over four, pregnant and lactating women – are shown in the U.S. RDA table on page 18.

The ten leader nutrients included in the U.S. RDA that must be listed on nutrition labels are protein, carbohydrate, fat, vitamin A, vitamin C, thiamin, riboflavin, niacin, calcium, and iron. Calories are also stated.

Twelve other vitamins and minerals may be listed on labels if manufacturers opt to do so. They *must* be listed when added to a food.

These are shown in Table 13. Nutrition labels list the U.S. RDA by percentages because preliminary studies showed that most consumers understand percentages and the use of 100 percent as meaning "complete." For sample labels and additional information about using nutrition labels, see page 33.

An extra margin of safety is included in the U.S. RDA because: (1) highest values on the 1968 RDA table were generally selected for use within each U.S. RDA category; and (2) a margin of safety was already included in the RDA. Thus, the U.S. RDA values frequently will be higher than the needs of most people.

Using the U.S. RDA

Percentages of the U.S. RDA for eight or more nutrients are given on the nutrition information panel of food labels. Generally, the consumer needs to know that the nutritional intake from a day's foods should approach 100 percent of the U.S. RDA.

For most nutrients, 100 percent of U.S. RDA is enough – or more than enough – for almost everyone. For a few nutrients, 100 percent of U.S. RDA may fall short of nutritional needs of certain groups of people or individuals.

Generally, women and children need the lowest percentages of the U.S. RDA to meet the RDA for their age groups. However, pregnant and lactating women have the greatest need for increased nutrient intakes to meet their RDA. Teenagers in some age groups need to get extra amounts of riboflavin and calcium but can meet the RDA for other nutrients with 100 percent or less of U.S. RDA. Men over 23 years can meet the RDA for all nutrients except vitamin A with somewhat less than 100 percent of the U.S. RDA.

Table 14

Extra Foods for Teenagers

Some sources of riboflavin, calcium

Food and Serving Size		% of U.S. RDA	
		Ribo-flavin	Cal-cium
Milk, whole skim	1 c	25	30
Milk, lowfat 2%	1 c	30	35
Cheese, American process	1 oz	8	20
Braunschweiger	1 sl	25	*
Cocoa, with milk	1 c	25	30
Yogurt, plain	1 c	25	25
Cheese, cottage	½ c	17½	12½
Chicken, thigh	2.3 oz	15	*
Broccoli	med stalk	20	15
Collards	½ c	10	17½

*Less than 10%

Source: USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use

Adjust Food to Varying Needs

The simplest way to allow for these differences in planning daily meals for a family is by adjusting the size and number of servings of food. Children 4-6 years can meet the RDA for their age group with smaller servings of food which give 1/3 to 1/2 less of the U.S. RDA for most nutrients. But, it is important to serve foods that provide enough iron and calcium.

For women 19-22 and 23-50, foods which provide about 1/5 to 1/4 less of the U.S. RDA will meet the RDA for most nutrients except iron. Food sources of iron should be selected carefully (see Table 9) to be sure of meeting the U.S. RDA if other nutrient intakes are reduced.

Second helpings of food (or snacks) chosen to supply extra amounts of riboflavin or calcium help meet the higher RDA for some teenage groups.

	To meet RDA for	Extra % of U.S. RDA needed: Riboflavin	Calcium
Boys	11-14 yrs		20
Boys	15-18 yrs	10	20
Men	19-22 yrs	10	
Girls	11-14 yrs		20
Girls	15-18 yrs		20

For some examples of foods and serving sizes which will help to supply extra riboflavin and calcium for those age/sex groups, see "Extra Foods for Teenagers," Table 14. Additional guidelines for planning meals to meet the RDA for different family members are provided on page 29.

Mean Heights and Weights and Recommended Energy Intake[a] Recommended Dietary Allowances, Revised 1980

Category	Age (years)	Weight (kg)	Weight (lb)	Height (cm)	Height (in)	Energy Needs (with range) (kcal)	(MJ)
Infants	0.0-0.5	6	13	60	24	kg × 115 (95-145)	kg × .48
	0.5-1.0	9	20	71	28	kg × 105 (80-135)	kg × .44
Children	1-3	13	29	90	35	1300 (900-1800)	5.5
	4-6	20	44	112	44	1700 (1300-2300)	7.1
	7-10	28	62	132	52	2400 (1650-3300)	10.1
Males	11-14	45	99	157	62	2700 (2000-3700)	11.3
	15-18	66	145	176	69	2800 (2100-3900)	11.8
	19-22	70	154	177	70	2900 (2500-3300)	12.2
	23-50	70	154	178	70	2700 (2300-3100)	11.3
	51-75	70	154	178	70	2400 (2000-2800)	10.1
	76+	70	154	178	70	2050 (1650-2450)	8.6
Females	11-14	46	101	157	62	2200 (1500-3000)	9.2
	15-18	55	120	163	64	2100 (1200-3000)	8.8
	19-22	55	120	163	64	2100 (1700-2500)	8.8
	23-50	55	120	163	64	2000 (1600-2400)	8.4
	51-75	55	120	163	64	1800 (1400-2200)	7.6
	76+	55	120	163	64	1600 (1200-2000)	6.7
Pregnancy						+300	
Lactation						+500	

[a] The data in this table have been assembled from the observed median heights and weights of children shown in Table 1, together with desirable weights for adults given in Table 2 for the mean heights of men (70 inches) and women (64 inches) between the ages of 18 and 34 years as surveyed in the U.S. population (HEW/NCHS data).

The energy allowances for the young adults are for men and women doing light work. The allowances for the two older groups represent mean energy needs over these age spans, allowing for a 2% decrease in basal (resting) metabolic rate per decade and a reduction in activity of 200 kcal/day for men and women between 51 and 75 years, 500 kcal for men over 75 years and 400 kcal for women over 75 (see text*). The customary range of daily energy output is shown for adults in parentheses, and is based on a variation in energy needs of ± 400 kcal at any one age (see text* and Garrow, 1978), emphasizing the wide range of energy intakes appropriate for any group of people.

Energy allowances for children through age 18 are based on median energy intakes of children of these ages followed in longitudinal growth studies. The values in parentheses are 10th and 90th percentiles of energy intake, to indicate the range of energy consumption among children of these ages (see text*).

*National Research Council, Food and Nutrition Board. 1980. *Recommended Dietary Allowances*. 9th rev. ed. Washington, D.C.: National Academy of Sciences.

Food and Nutrition Board, National Academy of Sciences – National Research Council

Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.

	Age (years)	Weight (kg)	Weight (lbs)	Height (cm)	Height (in)	Protein (g)	Fat-Soluble Vitamins: Vitamin A (μg R.E.)[b]	Fat-Soluble Vitamins: Vitamin D (μg)[c]	Fat-Soluble Vitamins: Vitamin E (mg α T.E.)[d]	Water-Soluble Vitamins: Vitamin C (mg)	Water-Soluble Vitamins: Thiamin (mg)	Water-Soluble Vitamins: Riboflavin (mg)	Water-Soluble Vitamins: Niacin (mg N.E.)[e]	Water-Soluble Vitamins: Vitamin B_6 (mg)	Water-Soluble Vitamins: Folacin[f] (μg)	Water-Soluble Vitamins: Vitamin B_{12} (μg)	Minerals: Calcium (mg)	Minerals: Phosphorus (mg)	Minerals: Magnesium (mg)	Minerals: Iron (mg)	Minerals: Zinc (mg)	Minerals: Iodine (μg)
Infants	0.0-0.5	6	13	60	24	kg × 2.2	420	10	3	35	0.3	0.4	6	0.3	30	0.5[g]	360	240	50	10	3	40
	0.5-1.0	9	20	71	28	kg × 2.0	400	10	4	35	0.5	0.6	8	0.6	45	1.5	540	360	70	15	5	50
Children	1-3	13	29	90	35	23	400	10	5	45	0.7	0.8	9	0.9	100	2.0	800	800	150	15	10	70
	4-6	20	44	112	44	30	500	10	6	45	0.9	1.0	11	1.3	200	2.5	800	800	200	10	10	90
	7-10	28	62	132	52	34	700	10	7	45	1.2	1.4	16	1.6	300	3.0	800	800	250	10	10	120
Males	11-14	45	99	157	62	45	1000	10	8	50	1.4	1.6	18	1.8	400	3.0	1200	1200	350	18	15	150
	15-18	66	145	176	69	56	1000	10	10	60	1.4	1.7	18	2.0	400	3.0	1200	1200	400	18	15	150
	19-22	70	154	177	70	56	1000	7.5	10	60	1.5	1.7	19	2.2	400	3.0	800	800	350	10	15	150
	23-50	70	154	178	70	56	1000	5	10	60	1.4	1.6	18	2.2	400	3.0	800	800	350	10	15	150
	51+	70	154	178	70	56	1000	5	10	60	1.2	1.4	16	2.2	400	3.0	800	800	350	10	15	150
Females	11-14	46	101	157	62	46	800	10	8	50	1.1	1.3	15	1.8	400	3.0	1200	1200	300	18	15	150
	15-18	55	120	163	64	46	800	10	8	60	1.1	1.3	14	2.0	400	3.0	1200	1200	300	18	15	150
	19-22	55	120	163	64	44	800	7.5	8	60	1.1	1.3	14	2.0	400	3.0	800	800	300	18	15	150
	23-50	55	120	163	64	44	800	5	8	60	1.0	1.2	13	2.0	400	3.0	800	800	300	18	15	150
	51+	55	120	163	64	44	800	5	8	60	1.0	1.2	13	2.0	400	3.0	800	800	300	10	15	150
Pregnant						+30	+200	+5	+2	+20	+0.4	+0.3	+2	+0.6	+400	+1.0	+400	+400	+150	[h]	+5	+25
Lactating						+20	+400	+5	+3	+40	+0.5	+0.5	+5	+0.5	+100	+1.0	+400	+400	+150	[h]	+10	+50

[a] The allowances are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined. See p. 23 for heights, weights and recommended intake.

[b] Retinol equivalents. 1 Retinol equivalent = 1 μg retinol or 6 μg β carotene. See text for calculation of vitamin A activity of diets as retinol equivalents.*

[c] As cholecalciferol. 1.0 μg cholecalciferol = 400 I.U. vitamin D.

[d] α-tocopherol equivalents. 1 mg d-α-tocopherol = 1 α T.E. See text for variation in allowances and calculation of vitamin E activity of the diet as α-tocopherol equivalents.

[e] 1 N.E. (niacin equivalent) is equal to 1 mg of niacin or 60 mg of dietary tryptophan.

[f] The folacin allowances refer to dietary sources as determined by *Lactobacillus casei* assay after treatment with enzymes ("conjugases") to make polyglutamyl forms of the vitamin available to the test organism.

[g] The RDA for vitamin B_{12} in infants is based on average concentration of the vitamin in human milk. The allowances after weaning are based on energy intake (as recommended by the American Academy of Pediatrics) and consideration of other factors such as intestinal absorption; see text.*

[h] The increased requirement during pregnancy cannot be met by the iron content of habitual American diets nor by the existing iron stores of many women; therefore the use of 30-60 mg of supplemental iron is recommended. Iron needs during lactation are not substantially different from those of non-pregnant women, but continued supplementation of the mother for 2-3 months after parturition is advisable in order to replenish stores depleted by pregnancy.

*Recommended Dietary Allowances, 9th rev. ed.

What Nutrition Surveys Tell Us About U.S. Diets

Surveys provide helpful information about the nation's food supply, the foods people eat, the sources and usage of nutrition information, and the nutritional status of people living in the United States.

All methods of assessing dietary adequacy or nutritional status have limitations, so interpretations need to be made carefully. Generally, surveys are useful in assessing nutritional status of population groups but have limited value for individual application.

Nationwide surveys are complex and costly, so only a limited number have been undertaken. Four recent surveys are of major significance:

The Ten-State Nutrition Survey, 1968-1970

The U.S. Department of Health, Education and Welfare sponsored the largest nutrition survey (23,846 families), ever made in the United States, The Ten-State Nutrition Survey (TSNS). It was conducted and reported in separate low income and higher income phases. Sampling was not representative of an entire population in a given area, so findings cannot be applied to overall state populations. Survey methods were chosen to detect early "risk" signals as well as to identify overt signs and symptoms of malnutrition. Findings included:

1. Large numbers of people at low-income levels in the U.S. do not get enough nutritious food to eat. Caloric value of diets and intakes of all nutrients studied were lowest for blacks and Mexican-Americans in southern states. Limited availability of calories relates to family income and reflects in total food intake and poorer growth performance of low-income children.
2. Iron deficiency was prevalent in diets of all age groups, regardless of income – especially among blacks in low-income states.
3. Foods rich in vitamin A were infrequently used in many households. Mexican-American families living in southern states and young people generally had low vitamin A levels.
4. Energy and protein intakes of low-income pregnant black women were 30 percent below those of white women of higher income.
5. Evidence did not indicate that iodine deficiency was a problem, although goiter incidence was higher than expected.
6. High incidence of dental caries in adolescents was associated with between-meal carbohydrate snacks, such as candy, soft drinks, and sweet pastries.
7. Obesity was prevalent and was a serious problem for adult black women and upper income adolescent boys.
8. Malnutrition varied – in severity and nutrients involved – for different population segments. Solutions to nutrition problems will therefore require varied approaches.
9. A widespread problem was that of poor food choices related to poor use of available food money – infrequent use of foods rich in vitamin A; strong preference for meat over less expensive fish, poultry, legumes, or nuts.

Preschool Nutrition Survey, sponsored by the U.S. Department of Health, Education and Welfare, 1968-1970

A cross-sectional nationwide survey of 3,441 preschool children 12 to 72 months old, representing all socioeconomic levels, lends support to the Ten-State Nutrition Survey research data. Findings, particularly of iron deficiencies in children in the lowest socioeconomic level of this survey, were strikingly similar to those of the TSNS.

Household Food Consumption Survey, conducted by the U.S. Department of Agriculture, 1965-1966

As part of the fifth family food consumption survey, made in spring 1965, a report published in January 1972 contains information obtained for the first time on food intake – but not nutritional status – of individual members of households for a 24-hour period. The survey of 14,519 men, women, and children found:

1. Average diets for most age/sex groups were near or above the 1968 RDA for energy, protein, vitamin A, thiamin, riboflavin, and vitamin C. Calcium and iron were most often below RDA.
2. In general, diets of males met RDA for more nutrients than diets of females. Except for iron, diets of children under nine were above RDA. Diets of adolescent girls and women were below RDA for calcium, iron, and thiamin; also vitamin A and riboflavin for some age groups. Diets of pregnant women were below RDA for calcium, iron, vitamin A; also thiamin, riboflavin for women 20-34 years. Older men had diets low in calcium, vitamin A, riboflavin, and vitamin C.

3. At income levels under $3,000 and for persons in rural areas and in the Southern Region, vitamin C, vitamin A, calcium, and iron were most often below RDA.

U.S. Department of Agriculture's Nationwide Food Consumption Survey, 1977-78.

Foods used by households in 1977 had a higher nutrient density than the food used in the 1965 Household Food Consumption Survey.

Levels of nutrients were measured in food available in the household. Findings included:

1. Average iron intakes of females 12 to 50 years were between 35 and 40 percent below the 1974 RDA.
2. Vitamin B_6 in adult groups were below the RDA, with that of women 35 and 40 percent below the 1974 RDA.
3. Average calcium intakes of women 12 years and older were 25 percent or more below the 1974 RDA.
4. Magnesium intakes were below the RDA for nearly all age/sex groups.

Health and Nutrition Examination Survey (HANES) conducted by the National Center for Health Statistics, Department of Health, Education and Welfare, 1971-1972.

HANES measured nutritional status by 1) dietary intakes, 2) results of biochemical tests for nutrients in blood and urine samples, 3) clinical examinations, and 4) various body measurements. The findings included:

1. Obesity is most prevalent in women, particularly in older Negro women 45-74 years of age, regardless of income level. White men had a higher incidence of obesity than Negro men regardless of income level. Lower income levels were associated with a higher prevalence of obesity.
2. Negroes showed generally higher prevalence of nutrient deficiencies for vitamins A, C, and D, thiamin, calcium-phosphorus, and iodine, than whites, disregarding age and income level.

Applying Nutrient Recommendations in Everyday Food for People

Various food guides have been devised to translate the technical language of nutrients and recommended dietary allowances into terms of everyday eating. As scientists' knowledge of food and nutrition increased, foods were seen to contain more than one nutrient. In addition, it was found that certain types of food contain specific nutrients in about the same quantity. Thus, on the basis of their similar nutrient content, foods can be classified into groups. Nutrient-based food groups are generally reliable as good suppliers of specific nutrients.

As scientists also learned approximately how much of each essential nutrient was desirable – for growth and for maintenance and repair of the body at various ages and conditions – recommendations could be made about the amount of food from each food group that should be eaten each day.

The following food group plan is a simple one. The *Guide to Good Eating: A Recommended Daily Pattern* is based on the Recommended Dietary Allowances (NRC).

Guide to Good Eating: A Recommended Daily Pattern

Think: nutrients

The recommended daily pattern provides the foundation for a nutritious, healthful diet. The recommended servings supply about 1200 Calories. Adjust the size of servings as needed for growth, energy and to maintain desirable weight.

Think:
calcium
riboflavin (B_2)
protein

Milk Group

3 Servings/Child
4 Servings/Teenager
2 Servings/Adult
4 Servings/Pregnant Woman
4 Servings/Lactating Woman

Foods made from milk contribute part of the nutrients supplied by a serving of milk.

Think:
protein
niacin
iron
thiamin (B_1)

Meat Group

2 Servings
3 Servings/Pregnant Woman

Dry beans and peas, soy extenders, and nuts combined with animal protein (meat, fish, poultry, eggs, milk, cheese) or grain protein can be substituted for a serving of meat.

Think:
vitamin A
vitamin C

Fruit-Vegetable Group

4 Servings

Dark green, leafy, or orange vegetables and fruit are recommended 3 or 4 times weekly for vitamin A. Citrus fruit is recommended daily for vitamin C.

Think:
carbohydrate
thiamin (B_1)
iron
niacin

Grain Group

4 Servings

Whole grain, fortified, or enriched grain products are recommended.

Think:
carbohydrate
fat

Others

Fats, sweets, and condiments complement but do not replace, foods from the four groups. Amounts should be determined by individual caloric needs.

The leader nutrients listed for food groups are those that may be on food labels.

Teamwork of the Food Groups

The *Guide* based on Four Food Groups and Others should be interpreted as a *foundation* for making daily food choices. The important point is that the *Guide* shows the types of foods to *emphasize*.

Each food group makes special nutrient contributions. Foods from all the groups work together to supply energy and nutrients necessary for health and for growth. Everyone needs the nutrients from the Four Food Groups. Adjustments in amounts for children, teenagers, and adults are easily made in the number or size of servings. The table, "Percentage Contribution of Food Groups to Nutrient Supplies Available for Consumption in 1976," on page 23, shows that the Four Food Groups foods contribute from 89.7 to 99.9 percent of the leader nutrients in 64.4 percent of the calories. Others contribute the remaining nutrients in 35.6 percent of the calories.

When the minimum number of servings for each group is used in daily meals and snacks, a large share of the U.S. RDA can be met. A further comparison of the nutrient contributions of the *Guide* with the RDA can be made using this table.

People do not need such detail for day-to-day food selection, but the information shows that:

1. The *Guide* suggestions are practical for use by people with limited knowledge of nutrient values.
2. When the *additional foods* that complete meals include *more* servings from the Four Food Groups rather than from "Others," more nutrient-dense foods will be consumed.
3. Usually more food is needed for energy, or calories. "Others" used in meals provide mainly calories.

Table 15

Percentage Contribution of Food Groups to Nutrient Supplies Available for Consumption in 1976[1]

Foods	Calories	Protein	Vitamin A value	Vitamin C	Thiamin	Riboflavin	Niacin	Calcium	Iron
Milk Group	11.2	21.9	13.0	3.7	8.6	38.6	1.4[2]	75.0	2.3
Meat Group	25.1	53.3	28.3	1.0	32.7	31.0	52.5	9.2	42.0
Fruit-Vegetable Group	8.9	6.9	48.0	91.1	17.3	8.9	15.2	9.7	18.7
Grain Group	19.2	17.3	0.4	0	41.3	20.8	27.4	3.4	27.4
Others	35.6	0.6	10.3	3.4	0.1	0.6	3.5	2.8	9.6

[1]Source: USDA NSF-158 *National Food Situation*.

[2]Tryptophan, a niacin precursor in milk, will provide additional niacin equivalents. These equivalents are not included in this figure.

Milk Group

Milk Group foods include: whole, lowfat, skim, evaporated, and chocolate milk; buttermilk; nonfat dry milk; many varieties of cheese; cottage cheese; ice cream; yogurt; soups, puddings, cocoa, and other beverages made with milk. Alternate choices for equivalent calcium are listed below.

One serving of milk, chocolate milk, buttermilk, or yogurt is one 8-ounce cup or glass (½ pint, 237 ml). One serving of cheese is one 1 ounce slice, or ½ cup (119 ml) cottage cheese. One serving of ice cream is ½ cup (¼ pint, 119 ml).

Milk stands out in its contributions of calcium, riboflavin, and high quality protein. Vitamin D milk is fortified with vitamin D. Lowfat, skim, or nonfat milks are fortified with vitamins A and D to replace that lost when the milkfat is removed.

In 1976, Milk Group foods supplied 75 percent of the calcium, 21.9 percent of the protein, and 38.6 percent of the riboflavin available for consumption in our national food supply.

Calcium Equivalents in Milk Alternates

1 cup (237 ml) milk has the same amount of calcium as:

1 cup (237 ml) buttermilk, chocolate milk, cocoa, and yogurt

1 cup (237 ml) pudding made with milk

1 slice (1 oz) Swiss cheese

1½ slices (1½ oz) Cheddar and American process cheese

1½ cups (356 ml) collard, kale, mustard, and turnip greens

1¾ cups (415 ml) ice cream

2 cups (474 ml) cottage cheese

Meat Group

Meat, poultry, fish, and eggs provide high quality protein, niacin, iron, and thiamin. Legumes (dry peas and beans, peanuts) and nuts are also significant sources of these nutrients; soybeans contain the highest biologic-value protein among the vegetable sources.

A small serving is 2 ounces of cooked meat, poultry, or fish, not including bones or fat. About 1/3 pound raw meat makes two 2-ounce servings when cooked. A small meat patty or lamb chop is about a 2-ounce serving. These also give about the same amount of protein: 2 eggs; 2 slices (2 oz) Cheddar-type cheese; ½ cup (119 ml) cottage cheese; 2 cups (474 ml) milk; 1 cup (237 ml) cooked dry beans, peas, or lentils; scant half-cup (119 ml) peanuts; 4 tablespoons (60 ml) peanut butter; 2 frankfurters; 6 pork sausage links (3 ounces cooked).

In 1976, Meat Group foods supplied 53.3 percent of the protein, 52.5 percent of the niacin, 42 percent of the iron, and 32.7 percent of the thiamin available for consumption in our national food supply.

Fruit-Vegetable Group

Fruit-Vegetable Group includes a wide selection in fresh, frozen, canned, liquid and dried forms. See pages 7, 8 for food sources of vitamins A and C.

A serving is ½ cup (119 ml) or a portion as ordinarily served – a medium apple, banana, tomato, or potato, or half a medium grapefruit or cantaloupe.

This food group is the primary source of vitamin C. It also contributes important amounts of vitamin A. It supplies fiber, too, which aids in regular elimination.

This group provided 91.1 percent of the vitamin C and 48 percent of the vitamin A available for consumption in our 1976 national food supply.

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Grain Group

Grain Group foods include all kinds of yeast and quick breads; white or whole grain flour; ready-to-eat and cooked cereals; macaroni, spaghetti, and noodles; tortillas and grits; *whole grain, enriched, restored, or fortified.*

"Enrichment" is the addition of one or more vitamin(s), mineral(s), or protein(s) which are naturally present in lesser amounts, to increase the consumption of such nutrient(s).

"Restoration" is the addition of one or more vitamin(s), mineral(s), or protein(s) to a processed food in order to restore such nutrient(s) lost during processing to the level naturally present in the unprocessed food.

"Fortification" is the addition to a food of one or more vitamin(s), mineral(s), or protein(s) not naturally present in the food in order to increase the consumption of such nutrients.

One serving from this food group is considered to be: 1 slice of bread, or 1 oz. usually about 1 cup (237 ml) ready-to-eat cereal, or ½ cup (119 ml) cooked cereal, rice, pasta, grits.

Grains contribute significant amounts of thiamin, iron, niacin, and carbohydrate. There is no RDA or U.S. RDA for carbohydrate. Grain Group foods supplied 41.3 percent of the thiamin, 27.4 percent of the iron, and 27.4 percent of the niacin available for consumption in our 1976 national food supply.

Others not included in the food groups are foods such as fats, sweets, desserts, and condiments. Amounts, or servings, should be determined by individual caloric needs.

Fats and oils help make a meal flavorful and satisfying. Fats are high in food energy, or calories. Butter and margarine supply vitamin A; oils supply the essential fatty acid, linoleic acid.

Sugar adds flavor and yields energy in the body. High-sugar foods (including many desserts) are frequently nutrient-limited foods – high in calories and limited in nutrient value.

Condiments are valuable primarily as flavoring aids, not as sources of nutrients.

"Others" complement but do not replace foods from the Four Food Groups.

What About Combination Foods?

Foods that combine ingredients from two or more food groups are called combination foods. Deciding the food group to which these foods belong is more difficult, unless you make them at home and know what and how much of the different foods were ingredients.

You can check the order of listing of ingredients on food labels to find out the major components. The first listed is the one present in greatest amount by weight, and others follow in descending order by weight. For example, a meat pie listing water, beef steak, flour, fat, and salt might count as part of a serving each for the meat and grain groups. If meat had been listed first on the label, it could have counted as one meat serving. Knowledge of serving sizes is an important basis for judgement.

Or try to identify the nutrients which the food supplies (check the nutrition information on the label, if available). Otherwise, look at the ingredient listing. Then identify the nutrients supplied by those ingredients. Which ones are listed first? A pizza with crust, cheese, tomato sauce, and seasonings supplies protein, calcium, riboflavin, thiamin, vitamin C, vitamin A, niacin, and iron, with highest amounts of calcium, riboflavin, and protein, but also important amounts of thiamin, niacin, and iron. It actually provides nutrients and foods from all the Four Food Groups.

Contrast pizza with a gelatin dessert made with sugar, water, gelatin, and flavoring. It supplies only carbohydrate. Thus gelatin is classified in "Others."

What About Fabricated Foods?

Most consumers have used some fabricated foods – powdered juice-flavored drinks, cookie-like products to replace an entire meal, scrambled egg substitutes, vegetable protein meat extenders and meat analogues formed like meats. These foods are made from ingredients not usually associated with certain types of food. Or, they are made in unusual shapes and forms. Ingredient and nutrient listings on food labels provide the only clues for categorizing them into food groups or "Others."

Some of these food items are appropriately fortified and correspond in some nutrients to their more traditional counterparts. But requirements are established for only about one-third of the known essential nutrients. And all micronutrients occurring in foods are not yet known, nor their functions fully understood. So, many fabricated foods do not contain all the vitamins and minerals present in fresh and traditionally processed foods.

To use these foods occasionally in meals based on the food groups, check the labels for ingredients and any added nutrients. A vitamin-C-fortified beverage might be counted as a Fruit-Vegetable serving. A serving of vegetable protein breakfast patties would count in the Meat Group.

Planning Meals And Snacks: Balancing Nutrient and Food Needs

Planning does not mean making rigid rules that must be adhered to every day. It is simply having a "roadmap" to guide those responsible for food preparation. Planning makes it easier to: provide enjoyable mealtimes, guide children in forming healthful food habits, meet the nutrient needs of various family members, shop for food, control food costs, and adjust to individual and family variations.

The pattern on page 31 may aid in helping family food managers "get started." The goal is meeting the recommendations in each food group and adding other pleasing foods so each person has enough to eat, but no more than is needed. Moderation is a key to maintaining normal weight for height.

Food or Meals?

It is the *total food eaten during the day* that is important. Remember, however, that meals can also provide social values as well as just food. The body seems to work more efficiently if it receives nourishment at regular well-spaced intervals throughout the day, which may be due, in part, to mealtime relaxation.

Many people still prefer the American custom of three meals a day. Others find that four to six smaller meals suit their needs and situations better. Where practical, a pattern of frequent, smaller meals is nutritionally sound. Snacking can fit into the day's total food if snacks are chosen to supply leader nutrients – not just calories. The sample plan on page 31 allows for flexibility in meal and snack patterns. It includes nutrient-plus foods that can be eaten with meals or between, as snacks or as a series of small meals.

Use Guide, Think Nutrients

The *Guide to Good Eating . . . A Recommended Daily Pattern* provides the foundation for daily food choices. In using the *Guide* with individuals or groups, a goal is to use the food groups as a convenient basis for planning the day's food intake, and to gradually develop the ability to "think nutrients."

Knowledge of nutrient sources and their functions helps consumers to make nutrient-wise choices of foods from each food group, then to complete meals with foods to suit their needs and preferences. (Consult the "Focus on Nutrients" section, pages 5 to 14, when relating the *Guide* to nutrient functions and sources. Refer also to pages 24 to 27 to interpret foods in each group.)

Food Needs of Different Family Members

All the family, except infants and those on a medically prescribed diet, can usually eat the same basic meals. Children, teenagers, adults (including older family members and pregnant and lactating women) need the same nutrients. Amounts recommended for health maintenance may differ for each. Therefore, the amounts of various foods that different family members should eat vary according to their sex, size, activity, and whether growth is taking place.

Approximate amounts eaten by various family members are shown for a sample day's meals on page 31. Amounts shown meet or exceed the 1980 RDA (NRC) for each age/sex group in calories and for protein, vitamins A and C, thiamin, riboflavin, niacin, calcium, and iron. These amounts also provide 100 percent or more of U.S. RDA for adults and children over four (and 100% U.S. RDA for all but vitamin A and riboflavin for the pregnant woman 23 to 50).

Adjustments for Individuals

Some general guidelines for adjusting food to the needs of various family members are:

Children 1-3 years old need smaller amounts of food, but more body-building foods in proportion to size due to rapid growth. Choose food sources of iron, calcium, vitamin C for them carefully. Growth usually slows down at about age three.

Older children, 4-10 years, need average-size servings for their slower growth rate.

Teenagers usually need considerably more food, including extra or larger servings from the Milk, Fruit-Vegetable, and Meat Groups. Meeting iron, calcium, and possibly riboflavin needs is a special concern. Teenagers need more food for energy from second helpings or "Others" unless weight control is a problem.

Pregnant and nursing women need extra or larger servings from Milk, Fruit-Vegetable, and Meat Groups for increased needs. Special attention should be given to food sources of protein, iron, folacin, and calcium. Women under 23 have even greater nutrient needs at these times.

Women generally eat less food than men, thus may need to choose any extra servings from the food groups for needed nutrients, especially iron.

Older women's lower energy needs further limit them to choices mainly from the food groups for adequate nutrients.

Men generally require more food than women for caloric needs because they are usually larger, so they find it easier to meet nutrient needs.

Older men need less food, but need to choose carefully to get enough calcium, riboflavin, vitamins A, C.

Table 16

Percentage of Protein in Selected Foods[1,2]

Combine foods to get 25 percent of U.S. RDA	Percent U.S. RDA
Milk, whole/skim (1 c, 244 g)	20
Buttermilk (1 c, 245 g)	20
Cheese, cottage, creamed (¼ c, 62 g)	15
Cheese, American process (1 sl, 28 g)	15
Cocoa, with milk (¾ c, 188 g)	15
Egg, hard-cooked (1 large, 50 g)	15
Egg, fried (1 large, 46 g)	15
Egg, scrambled (1 large, 64 g)	15
Frankfurter (2 oz, 56 g)	15
Peanut butter (2 tbsp, 32 g)	15
*Beans, refried (½ c, 150 g)	14
Bacon (2 slices, ½ oz, 15 g)	10
Pork Sausage (2 links, 2 oz, 56 g)	10
Soup, cream of tomato, with milk (1 c, 250 g)	10
Bagel (3", 55 g)	10
Bread, whole wheat (2 sl, 25-28 g)	8
Bread, white, enriched (2 sl, 23-28 g)	8
Roll, frankfurter, enriched (40 g)	6
Oatmeal (½ c, 120 g)	4
Rice, white, enriched (½ c, 103 g)	3
Grits, enriched (½ c, 123 g)	2
*Cornflakes (¾ c, 190 g)	2

For best use of plant protein foods by the body, combine an animal protein food with a plant protein food.

Sources:
[1]USDA Agr Inf Bull 382
Nutrition Labeling—Tools for Its Use
[2]*National Dairy Council 1974 *Food Models B012A*. Rosemont, IL.

Breakfast Rates Prime Time

Breakfast is the prime time to replenish the body's lowered nutrient supplies for a new day. Skimping or skipping breakfast makes it difficult to get all the needed nutrients later from meals or snacks. Research shows that breakfast eaters are better able to think and learn during morning hours, can do more and better work, react quicker and tire less easily.

Teenage girls and women have the poorest breakfast habits. They give such reasons as: (1) not hungry; (2) watching weight; (3) food in the morning "makes me sick;" (4) not enough time.

A breakfast which supplies about one-fourth of the day's protein, calories, minerals, and vitamins is recommended. This amount helps the body perform more efficiently than a larger or a smaller morning meal, or a mid-morning snack (which studies show improves performance for breakfast skippers by only 45 percent). Because the blood sugar drops during the night, include foods which supply carbohydrate—to raise blood sugar—and protein, which helps to keep blood sugar from dropping rapidly later on.

Some foods which can be combined to furnish one-fourth of the U.S. RDA for protein are listed in Table 16. Enjoy traditional breakfast foods or try "different" ones to spark interest. To encourage better breakfast habits:

1. Offer noneaters one food at first—fruit or cheese, a cup of cocoa or milk—and add more food gradually in the next two or three weeks.
2. Keep breakfast-ready foods on hand—ready-to-eat cereals and milk, fruit or juice and cheese, sandwiches or hard-cooked eggs and milk.
3. Plan a two-week "Give Breakfast a Try" time. Urge "skippers" to join, then honestly assess if they feel and perform better when they eat. Without breakfast, dieters are more apt to overeat at lunch. Studies show weight reduction is much easier to manage when breakfast is eaten.

Nutrient-Plus Snack Choices

Snacking has become a part of many Americans' eating habits. Probably the most effective way to influence snack habits is by following the *Guide to Good Eating* at mealtimes and by having on hand a variety of flavorful, nutrient-plus foods for snacking. Since calories from snacks add to total daily calories, most people will need to select snacks with both nutrients and calories in mind, to avoid a continued intake of excess calories. Excess calories are stored as body fat and can lead to overweight and obesity.

Growing children and teenagers usually need to eat some food between (but not just before) meals to meet their increased energy and nutrient needs. Plan snacks as an integral part of the daily diet with selections from the Four Food Groups. Snacks high in concentrated sugars and fat are more likely to dull mealtime appetite, crowd out body-building foods, and contribute to overweight. High-sugar snacks also contribute to tooth decay unless teeth are cleaned after eating.

Planning Vegetarian Diets

Planning is the key to adequate nutrition for persons who adopt vegetarian diets. Vegetarian diets include *vegan* (total) vegetarian—only plant foods, excluding all foods of animal origin; *lactovegetarian*—plant foods plus milk and other dairy products; *lacto-ovovegetarian*—plant foods and milk plus eggs. The quantity and quality of protein is a main concern (see page 6), as in any diet. The greatest risk is relying on only one plant food source.

In 1974, the Food and Nutrition Board (NRC) issued a statement that vegetarians can be well nourished *if* they include: (1) a variety of plant foods; (2) food rich in calcium, vitamin A, and riboflavin; (3) sources of vitamins D and B_{12}. However, they warned against adopting severely restrictive diets, such as the Zen macrobiotic diet, which relies heavily or exclusively on cereal grains. Milk and eggs are recommended especially for preschool children to ensure adequate calcium, iron, riboflavin, and vitamins D and B_{12} for growth.

The Food Groups can be applied in planning vegetarian diets. The Milk Group is an important source of calcium, riboflavin, protein, and vitamins D and B_{12}. A cup of milk supplies 29 percent of the RDA for vitamin B_{12}. A vitamin B_{12} supplement is advised for vegans, because vitamin B_{12} is found only in foods from an animal source.

Table 2, "Protein Teams that Work Together" is an aid in substituting plant foods for animal foods in the Meat Group. Vegetarians may require increased amounts of food to meet energy and nutrient needs. When weight control is a problem, the use of high calorie, nutrient-limited foods should be restricted, as in any dietary regimen.

The Food Groups		A Day's Meals/Snacks	Approximate Amounts Eaten by Various Family Members					
A Foundation		A Sample Plan	1 to 3 year-old	Girl 11-14†	Boy 15-18†	Man 23-50†	Woman 23-50†	Pregnant Woman 23-50
Meat	1	Egg* (hard-cooked as snack)	1 egg	1 egg	1 egg	1 egg	1 egg	1 egg
Fruit-Vegetable	1	Tomato Juice*	¼ cup	½ cup	½ cup	½ cup	½ cup	½ cup
Grain	2	Enriched Instant Farina	½ cup	½ cup	¾ cup	¾ cup	½ cup	¾ cup
		Toast (enriched bread)	½ slice	1 slice	1 slice	1 slice	1 slice	1 slice
Milk	1	Milk (to drink, on cereal)	¾ cup	1 cup	1 cup	1 cup	1 cup	1 cup
Others		Butter	½ tsp	1 tsp	1 tsp	1 tsp	1 tsp	1 tsp
		Jelly	—	2 tbsp	2 tbsp	2 tbsp	1 tbsp	1 tbsp
		Coffee or tea	—	—	—	2 cups	2 cups	2 cups
		A Lunch or Supper Plan						
Meat	1	Peanut Butter Sandwich*	1 tbsp	2 tbsp	4 tbsp	4 tbsp	2 tbsp	2 tbsp
Fruit-Vegetable	2	Vegetable Soup	½ cup	1 cup	1 cup	1 cup	1 cup	1 cup
		Banana (for dessert)	½ medium	1 medium	1 medium	1 medium	1 medium	1 medium
Grain	3	Enriched Bread (for sandwich)	1 slice	2 slices	2 slices	2 slices	2 slices	2 slices
		Saltine Crackers (with soup)	2 squares	5 squares	5 squares	5 squares	5 squares	5 squares
Milk	1	Milk*	¾ cup	1 cup	1 cup	—	—	1 cup
Others		Butter for sandwich	—	—	—	—	2 tsp	2 tsp
		Coffee or tea	—	—	—	1 cup	1 cup	1 cup
		A Dinner Plan						
Meat	1	Meat Loaf	1½-ounces	3-ounces	3-ounces	3-ounces	3-ounces	3-ounces
Fruit-Vegetable	3	Baked Potato	½ medium	1 medium	2 medium	2 medium	1 medium	1 medium
		Buttered Cabbage	¼ cup	½ cup	½ cup	½ cup	½ cup	½ cup
		Tossed Salad	¼ cup	¾ cup	1 cup	1 cup	¾ cup	¾ cup
Grain	1	Whole Wheat Bread	½ slice	1 slice	2 slices	2 slices	1 slice	1 slice
Milk	1	Strawberry Yogurt*	¼ cup	1 cup	1 cup	1 cup	1 cup	1 cup
Others		Catsup	—	1 tbsp	2 tbsp	2 tbsp	1 tbsp	1 tbsp
		French Dressing	½ tbsp	1 tbsp	1 tbsp	1 tbsp	1 tbsp	1 tbsp
		Butter for bread, on vegetables	1 tsp	1 tbsp	2 tbsp	2 tbsp	2 tsp	2 tsp
		Coffee or tea	—	—	—	1 cup	1 cup	1 cup
		Extra Snacks						
Milk	½-1	Milk	½ cup	1 cup	1 cup	—	—	¾ cup
Fruit-Vegetable		Raisins,	2 tbsp		4½ tbsp	4½ tbsp		
		Pear	½ medium	—	—	1	1	1
Grain		Graham Crackers	2		4	4		
Totals: Meat	2+	*These foods may be eaten with or between meals —as nutrient-plus snacks.	1300	2403	3022	2689	2003	2300 CALORIES
Fr-Veg	4+							
Grain	4+							
Milk	2-4							

† These amounts supply 100% U.S. RDA or more for eight key nutrients. Amounts for all age/sex groups also meet or exceed the 1974 RDA (NRC).

Table 17

Cost of 20 Grams of Protein*

Food (ready-to-eat)	Price per Market Unit		Cost of 20 Grams	
	(Cents)			
Beans, dry	42.5	lb		10
Peanut butter	71.9	12 oz		17
Beef liver	72.0	lb		17
Bread, white, enriched	35.3	lb		18
Chicken, whole	54.6	lb		20
Beef, ground	85.5	lb		21
Milk, whole	83.2	half gal		24
Turkey, ready-to-cook	70.0	lb		25
Eggs, large	96.7	dozen		25
Chicken, breasts	107.0	lb		27
Pork, picnic	84.4	lb		27
Tuna, canned	66.6	6.5 oz		30
Bean soup, canned	31.0	11.25 oz		30
Beef, chuck roast	92.6	lb		32
Cheese, American process	87.9	8 oz		33
Beef, round steak	175.4	lb		38
Ham, whole	134.6	lb		39
Frankfurters	112.6	lb		41
Pork loin roast	127.2	lb		42
Braunschweiger	74.2	8 oz		44
Beef, rump roast	174.8	lb		45
Salami	91.7	8 oz		46
Sardines, canned	54.0	4 oz		51
Ham, canned	213.0	lb		51
Beef, sirloin steak	189.6	lb		53
Bologna	77.1	8 oz		56
Perch, ocean, fillet, frozen	160.8	lb		58
Beef, rib roast	179.6	lb		59
Pork chops, center cut	171.7	lb		60
Haddock, fillet, frozen	171.9	lb		61
Veal cutlets	308.5	lb		66
Pork sausage	132.1	lb		68
Bacon, sliced	144.5	lb		76
Beef, porterhouse steak	236.0	lb		80
Lamb chops, loin	289.0	lb		89

*Cost of Meat and Meat alternates. May 1977. Agriculture Research Service, USDA.

Advance planning helps to: control food spending, take advantage of price savings, curtail travel costs, and save shopping time and energy. Useful planning aids include: recipes, menu plans, food ads, store flyers, cents-off coupons, plentiful foods reports, and written shopping lists. Plan where to buy, too. Price structures of food retailers vary, and shopping at several stores if practical can reap substantial savings.

Plan purchases from the Meat Group first, since the largest share of food dollars usually goes for meats. Prices of meats, poultry, fish, and eggs vary at different times. Consider the price per serving. A comparison of approximate costs of different sources of 20 grams of protein (about one-third the U.S. RDA for protein) is shown in the "Cost of 20 Grams of Protein," Table 17. This comparison points up the economy of using less expensive protein sources as well as meat alternates and extenders.

Certain cuts or parts of meat that are less in demand often cost less: neck slices, short ribs, riblets, shoulder cuts, less tender steaks and roasts; pork, chicken, and beef liver, tongue, heart; stew meat, poultry wings and legs. Other good buys at times are: 70-75% lean ground beef; ground pork, lamb, turkey; stewing chicken; liver sausage; frankfurters, canned chum or pink salmon; chunk-style or flaked tuna or bonita; medium eggs.

Compare Costs

Compare the cost per unit of measure—an ounce of one brand of peanut butter with an ounce of another brand—to get true price comparisons. *Unit pricing* signs in some stores show brand, container size, total price, and price per unit. Before buying, check the cost of different qualities of a food, and compare fresh, frozen, canned, and dried forms. Costs of different forms and qualities will vary, but nutrient values can be relied on to be about the same. If a serving of canned whole tomatoes costs less than one of fresh tomatoes, try slicing canned tomatoes or buy canned wedges or slices for salad. Save, too, by choosing day-old bread for toast, mushroom stems and pieces for casseroles, flaked tuna for salads and casseroles.

Waste Not, Spend Less

Food waste is often overlooked as a factor in food costs. In a recent survey the average yearly cost of food waste was $80 to $100 a household. Improper handling, buying poor quality or purchasing too much, too-large portions, resulting in plate waste, and forgetting refrigerated items are wasteful practices.

Compare Label Information

In the store, consumers have important information about food products available at their fingertips—on the labels. By Federal law, all food labels must show: (1) the identity of the food—what it is—on the main part of the label; (2) the net weight or volume; and (3) the name and address of the food manufacturer, packer, or distributor.

Other kinds of label information which may or may not be required on certain food products are:

1. **The ingredients**—For most products all ingredients must be listed in descending order of their relative weights. An ingredients list is not required if the whole product is just one thing, as milk or if a "standard of identity" has been defined for a common food, such as mayonnaise. However, many new standards of identity call for an ingredient list on the label.
2. **Labeling of flavor**—All labels must say when a food contains spices, flavoring, and colorings. New regulations specify required wording when natural and (or) artificial flavorings are used, for example:
   - *vanilla pudding*—has only natural flavoring.
   - *vanilla-flavored pudding*—has more natural than added artificial flavoring.
   - *artificially flavored vanilla pudding*—has either all artificial flavoring or predominantly artificial flavoring.
3. **Food Dating Systems**—Food containers or labels may be dated voluntarily, either with date codes using symbols (some may be hard to decipher) or with "open dates" anyone can read. Most dating systems allow a period of time when the product will be at peak quality, then a period when it will continue to be acceptable and usable.
4. **Universal Product Code System**—The square mark shown at left is designed for use by supermarkets in automated food checkouts and computerized inventory control systems.
5. **Nutrition Information**—Nutrition labeling is a significant source of information about the nutrient content of foods based on the U.S. RDA, discussed on page 33.

About Nutrition Labeling

For ease in reading and comparing labels, the nutrition information panel of the label must appear in a standard design placed at the right of the principal display panel, unless space does not permit. Label information must always appear in the same order as shown on the sample labels at the right.

What's On Nutrition Information Panels?

1. Nutrition information is given for one-serving amounts. The label gives the size of a serving for example, one cup or two ounces or two tablespoons and tells how many servings are in the container.
2. The number of calories is listed, then the amounts in grams of protein, carbohydrate, and fat.
3. Protein is listed twice -- in grams and as a percentage of the U.S. Recommended Daily Allowances.
4. Seven vitamins and minerals and their percentage of the U.S. RDA *must* be shown in the same order as on the sample label at the right. For additional information about the U.S. RDA, see page 17.
5. Twelve other vitamins and minerals (listed in Table 13) *may* also be named.
6. Listing percentage of calories from fat; amounts of fatty acids, cholesterol, and sodium is optional.

How to Use Nutrition Information Panels

Nutrition labeling provides nutrition educators with a valuable tool to help consumers apply nutrition information at a practical, everyday level. Consumers can use nutrition labels to:

1. Identify foods which are major sources for each of the leader nutrients.
2. Compare and contrast nutrient composition of a variety of food items.
3. Choose foods providing the best nutritional value for the money spent.
4. Choose foods providing the best nutritional value for the calories consumed.
5. Estimate the nutritional adequacy of a day's food intake.
6. Make appropriate additions or substitutions to improve a nutritionally inadequate diet.
7. Select food for special diets recommended by physicians, such as low sodium.

Minimum information that must appear on a nutrition label is:

Nutrition Information Per Serving

Serving Size	One cup
Servings per container	8
Calories	150
Protein	8 grams
Carbohydrate	11 grams
Fat	8 grams

Percentage of U.S. Recommended Daily Allowances (U.S. RDA)

Protein	20
Vitamin A	4
Vitamin C	4
Thiamin	6
Riboflavin	25
Niacin	0
Calcium	30
Iron	0

Nutrition Information Per Serving

Serving Size	One cup
Servings per container	8
Calories	150
Protein	8 grams
Carbohydrate	11 grams
Fat	8 grams
Sodium	120 mg

Percentage of U.S. Recommended Daily Allowances (U.S. RDA)

Protein	20
Vitamin A	4
Vitamin C	4
Thiamin	6
Riboflavin	25
Niacin	0
Calcium	30
Iron	0

People and Food: Meanings Affect Use

Eating is an experience we all share. All people need food to sustain life. The preparing and eating of food interweave our everyday lives. Yet, food is regarded in many different ways in various parts of the world, and even within this country. An understanding of meanings sometimes attached to foods gives insights for improving food habits and more effective use of food.

A Personal View of Food

Eating is a complex, personal experience which anthropologist Dorothy Lee portrays:

"Food can bring to life my keen anticipation . . . it can evoke my memory in all its pain and joy, it can pierce me with nostalgia . . . Its preparation can be an act of relatedness . . . of creativity, of love; its eating can be participation and communion. Let us hope it also nourishes . . . me with the . . . nutrients I need to stay alive and healthy so that I can exercise the fullness of human existence."*

Shortly after birth the human infant begins the long education in eating. Love and food intermingle. Feelings of closeness to and dependence on the one who feeds the infant mix with relief from hunger and the comfort from being held. A deep, emotional attachment for food develops. Lifelong attitudes toward eating reflect how well one's early food needs are met – by how well accepted and secure one feels. As long as one relies on others for food, the learning of food behavior continues.

Food, Family, and Culture

The family has the greatest influence on the development of food attitudes, beliefs, and practices. Every family has some special food customs. Much of a family's food pattern, however, comes from the culture in which it lives. Culture is an organized set of learned responses that guides members of a group or a society in a way of life. Ethnic and other subgroups in a society develop some distinctive food patterns. But all individuals are affected in many ways by their larger culture.

A society's food ways are also subject to the availability of food, which is influenced by climate, geography, population size, economic conditions, and technological development.

Food Symbolism and Meanings

Because our food experiences have emotional roots, food takes on symbolic as well as rational meanings. Helen Gifft, Marjorie Washbon, and Gail Harrison in their book *Nutrition, Behavior, and Change* relate most important meanings of food to "security" – a desirable state. The specific type of security that a food can seem to bestow may be biological, emotional, or sociological in nature, or any combination of these.

People are mostly unaware of the meanings of their use of food as symbols. Some may be:

1. "Special" foods – Milk and soft, bland foods are commonly "baby foods." Milk may later be turned to or rejected as a symbol of security and the dependence of babyhood. It may represent safety in times of extreme hazard. Certain foods may be served or restricted for illness, such as tea or chicken soup.
2. "Health" foods – Those that different peoples think to be good or bad for health, safe or unsafe. Incomplete knowledge and ignorance give rise to a changing array of food fads and myths.
3. Foods as emotional props or outlets – Children and adults use food to vent or help manage their feelings of boredom, anxiety, frustration, tension, sadness, loneliness, anger.
4. Food as a means of influencing others – Babies soon learn that eating or not eating affects parental responses. Adults, too, use foods to reward and punish themselves and others.
5. Foods as status symbols – Foods considered superior or inferior exist in all societies. By eating high-prestige foods – steak, caviar, white bread or rice, chocolate fondue – some persons try to increase their feelings of self-worth.
6. Food taboos – Specific kinds of food and mixtures of food are prohibited by each society. Taboo foods may be considered evil, unholy, or dirty, or thought to impart undesirable qualities.
7. Foods as symbols of belonging and as means of communication – Gifts of food and the act of eating together make us feel that we belong and are accepted. Sharing food enhances communication and helps us to relate to other people.

*Lee, D. 1964. Food and Human Existence. *Nutrition News* 25:9-10. Rosemont: National Dairy Council.

Toward Consumer Competence in Using Nutrition Communications

The frequency and fragmentation of nutrition communications reaching consumers today present problems in selecting and organizing which ones to believe and use. Many consumers are concerned about the safety, wholesomeness, and adequacy of our food supply. Food fads, myths, and superstitions persist – and flourish. With more nutrition information available than ever before, some guidelines for evaluating its authenticity are suggested as aids for nutrition educators and consumers.

Criteria for Evaluating Nutrition Communications

Who is the source of the communication? What career position, education, professional affiliations and accomplishments, reputation, and financial interests does the communicator have that relate to this communication?

What proves the authenticity of this communication? Is it factual, specific, clear? Is it general, vague, highly emotional? Are scientific data given to document this information? How were data validated? Was it tested or evaluated in any other way? Are references or quotations used and identified? What is the basis for any conclusions, recommendations, appeals?

Where was the communication produced or presented? Is it available in any recorded form? Where?

When was the communication made or released? When was any supporting scientific research conducted? How often is it revised?

How can you check on it? Some sources to contact are: County or state (university) agricultural and home economics extension offices; county or state departments of health; Dairy Council offices; foods and nutrition departments of home economics at colleges or universities; local, state, or national home economics, dietetics, or medical associations.

Current Concerns of Consumers

Consumers are aware as never before of food – its cost, its availability in an overpopulated world, its safety, its nutritional quality. Certain food and nutrition topics are current concerns of consumers and consumer groups. The following information is presented as an aid to answering questions which you may encounter on such topics.

Controlling Weight

For many Americans, losing weight is a nagging concern. For some, gaining weight is troublesome. *Weight reduction should always be undertaken under a physician's direction* – unless the goal is to shed only a few pounds. Dieters' exercise programs, too, should be approved by a physician. Researchers have found that psychological problems contribute to overeating by many people, emphasizing the need for medical supervision during weight reduction.

Each pound of body fat is equivalent to approximately 3,500 Calories. Eating 3,500 Calories more than used for energy is required to gain one pound. A deficit of 3,500 Calories is required to lose one pound of body fat. For weight reduction, eating less food to limit calories can also restrict intake of essential nutrients. But the body's need for recommended amounts of protein, vitamins, minerals (and some carbohydrate and fat) continues though calories are cut.

Many weight reduction diets are available in convenient form, which would-be dieters can check with a physician or nutritionist. For most people the sound way to control weight is to improve basic eating habits. The *Guide to Good Eating* is an excellent foundation for a reducing diet. It provides essential nutrients, yet allows a modest amount of calories.

No specific food or combination of foods has any special ability to increase the rate of weight loss. Dieters may need to be reminded that excess pounds are neither gained nor lost in a few days. "Crash" diets should be discouraged because: (1) health is endangered when needed nutrients are omitted, (2) dieters do not stick to monotonous diets, get discouraged and have a feeling of failure, and (3) good eating habits needed to maintain weight are not established.

Exercise is often overlooked in weight control. Research has shown that increased exercise will help an individual to lose more weight, and will also maintain muscle tone. The Food and Nutrition Board (NRC) recommends "more exercise" rather than severe diet restriction because of the difficulty of getting essential nutrients.

Food Additives

Widespread consumer concern over the safety of food additives may be partly due to the fact that no chemical substance – natural or synthetic – can be proved absolutely safe for human use – just "relatively harmless." Also involved is

the lack of understanding of Federal controls over the use of food additives and the many benefits to our food supply derived from their use.

A food additive has been defined by the Food and Drug Administration (FDA) as: any substance put in foods that becomes part of the food and (or) affects the characteristics of the food. This applies not only to the intentional use of additives, but also to anything added inadvertently. The latter may be of natural origin – toxins from food spoilage organisms, infective organisms, or natural chemical parts of foods; or manmade sources – including agricultural chemicals, chemical changes from food processing, packaging materials, and accidental contaminants.

Many foods in their original, unprocessed state contain potentially harmful substances – toxicants – such as oxalic acid in spinach and rhubarb; hydrogen cyanide in lima beans; myristicin in nutmeg. Natural food toxicants are consumed without harm as long as the foods are not eaten exclusively or in outlandish amounts. Choosing a diet from a wide variety of foods not only is nutritionally sound, but also provides the best protection against the likelihood that any natural or manmade substance will reach a harmful level in the diet.

A chemical substance may be called toxic if it possesses the capability to produce harm when consumed. Virtually every chemical – water, salt, iron, vitamin D – is toxic at some level. Hazard, then, depends on the inherent toxicity of any substance and how much of it is consumed.

Before they can be used, food additives must be given extensive toxicity studies with test animals by the manufacturer. The use of an additive is evaluated and regulated by the FDA. An additive must be shown to: (1) perform a useful function in the food; (2) be safe for human consumption even if eaten in unusually or excessively large amounts over a lifetime; (3) makes no contribution to the growth of cancer in test animals even when the amounts fed in laboratory tests greatly exceed any amount possible for a human to consume in a lifetime.

More than 25 classifications of substances are in use as food additives. They serve to: preserve; enhance flavor or color; improve nutritive value; or perform various technical functions such as whitening, thickening, emulsifying. Without food additives, many food products would be unacceptable or unavailable to large numbers of consumers.

Health Foods

So-called "health" foods are no more or less healthful than conventional foods which often cost less. Foods equal in nutrient composition are equally healthful. Here are some facts about "health" foods presently in vogue.

1. About "natural" foods. **Facts** – Foods packaged without chemical additives or preservatives are no more healthful than others. Food additives are thoroughly tested for toxicity, more so than many "natural" substances in foods. Antioxidants prevent rancidity; preservatives prevent foods from becoming toxic from spoilage. Processing and refining make certain foods more digestible. When refining removes some nutrients, they can be restored with nutrient additives.
2. About "organic" foods. **Facts** – Long-term research shows no differences in nutrient composition between foods grown with animal or synthetic fertilizers – plants can't tell them apart. Nonhazardous levels of pesticides have been found in samplings of foods sold as "organic."
3. About "natural" vitamins. **Fact** – Manmade vitamins are utilized by the body exactly the same as natural vitamins. The chemical formulas are the same.
4. About massive vitamin doses. **Facts** – Excessive and prolonged self-dosing of vitamins, such as vitamins A and D, can be dangerously toxic. Vitamin preparations and other reliable nutritional supplements are prescribed by physicians for specific health problems. Most people, however, can count on a wide variety of foods to provide the nutrients necessary for health.
5. About vitamin E. **Facts** – So far, scientific findings disclose no special curative or age retarding properties or specific sexual powers for vitamin E.
6. About vegetable oils and calories. **Facts** – Each gram of fat, vegetable or animal, yields 9 calories. Vegetable-fat frozen desserts and table fats are equal in calories to those made from animal fat. They are equally digestible.
7. About lecithin. **Fact** – Lecithin has no demonstrated long-term effect on cholesterol level.
8. About cellulite. **Facts** – Although excess fat and flabby muscles have been called cellulite, it is nothing new or different, just body fat. Wherever stored, body fat is all the same thing.

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Food, Nutrition, and Health: Some Issues and Controversies

As the United States embarks on its third century as a nation, it faces many nutrition-related problems. The Ten-State Nutrition Survey confirmed that malnutrition and nutritional deficiencies existed in measurable degrees in parts of this country. However, the Field Foundation investigation reported in 1979 that federal food programs have made enormous progress in providing hungry Americans with an adequate diet. In addition, the latest Household Food Consumption Survey shows a higher nutrient density in diets chosen than in the previous survey.

Toward a National Nutrition Policy

The 1969 White House Conference on Food, Nutrition, and Health laid the groundwork for a national nutrition policy. It produced many recommendations to guide the President in policy formulation and initiated various consumer programs.

In June 1974, Senate hearings were held to consider a National Nutrition Policy Study which was sponsored by the Senate Select Committee on Nutrition and Human Needs. More than 2,000 persons attended the hearings.

The Panel on Nutrition and the Consumer recommended Five Imperatives of a National Food Policy, in brief: (1) Affirm a totally adequate global food supply as a basic goal; (2) Guarantee sufficient resources . . . to insure the production and distribution of a food supply that will provide a nutritious diet for all Americans whatever their economic status; (3) Recognize (that) decisions . . . involve professional competence . . . and a greater concern for nutrition – in all segments of the nation's food system: producer, processor, distributor, retailer, and consumer; (4) Allocate national resources (in two major policy categories – agriculture and nutrition); (5) Require that the nutritional needs of consumers be the first among domestic food system goals. These and other recommendations were used in drawing up proposals for the National Nutrition Policy.

In 1977, the staff of the U.S. Senate Select Committee on Nutrition and Human Needs prepared a report, *Dietary Goals for the United States*. These Dietary Goals stirred up a number of controversies. It was suggested that the dietary changes outlined in the report could provide protection from certain diseases, such as heart disease and cancer.

In 1980, the U.S. Departments of Agriculture and Health, Education, and Welfare issued *Nutrition and Your Health: Dietary Guidelines for Americans*. These guidelines recommend that healthy Americans eat a variety of foods and maintain ideal body weight. But these guidelines also created controversies chiefly because specific recommendations were made for healthy Americans to avoid excesses of specific dietary components, i.e. saturated fat, cholesterol, sugar, and sodium.

At about this same time, other sets of guidelines were released. The Food and Nutrition Board of the National Research Council made recommendations in its publication, *Toward Healthful Diets*. And issued by the American Medical Association were *The AMA Concepts of Nutrition and Health*. These two sets of guidelines basically recommend that the generally healthy American public select a nutritionally adequate diet from a wide variety of foods, within proper calorie constraints. Rather than suggesting that specific dietary components be limited except in specific, well defined cases, these reports suggest eating a wide variety of foods and maintaining an energy balance to achieve ideal weight.

Not one of these sets of guidelines alone is without controversy. But through continued scientific research, the development of dietary guidelines for all Americans may be closer at hand.

Hunger Knows No Boundaries

In the face of mounting pressures from the developing countries for more equitable distribution of resources through a world economic plan, the food production resources of the United States assume strategic importance.

Changing weather, widespread crop failures in large areas of the world, and the inexorable growth of population threaten millions of people in coming decades with hunger and malnutrition. The reality of those hungry millions is inescapable.

As Americans, we alone have a choice of how to use our amber fields of grain – whether for humanitarian purposes or for political gain. In the final analysis, our only choice may be to find the most effective ways to share our resources and our knowledge of how to produce food. In doing so, our food habits would almost certainly have to be revised.

Nutrient	Important Sources of Nutrient	Some major physiological functions		
		Provide energy	Build and maintain body cells	Regulate body processes
Protein	Meat, Poultry, Fish Dried Beans and Peas Egg Cheese Milk	Supplies 4 Calories per gram	Constitutes part of the structure of every cell, such as muscle, blood, and bone; supports growth and maintains healthy body cells	Constitutes part of enzymes, some hormones and body fluids, and antibodies that increase resistance to infection
Carbohydrate	Cereal Potatoes Dried Beans Corn Bread Sugar	Supplies 4 Calories per gram Major source of energy for central nervous system	Supplies energy so protein can be used for growth and maintenance of body cells	Unrefined products supply fiber—complex carbohydrates in fruits, vegetable, and whole grains—for regular elimination Assists in fat utilization
Fat	Shortening, Oil Butter, Margarine Salad Dressing Sausages	Supplies 9 Calories per gram	Constitutes part of the structure of every cell Supplies essential fatty acids	Provides and carries fat-soluble vitamins (A, D, E, and K)
Vitamin A (Retinol)	Liver Carrots Sweet Potatoes Greens Butter, Margarine		Assists formation and maintenance of skin and mucous membranes that line body cavities and tracts, such as nasal passages and intestinal tract, thus increasing resistance to infection	Functions in visual processes and forms visual purple, thus promoting healthy eye tissues and eye adaptation in dim light
Vitamin C (Ascorbic Acid)	Broccoli Orange Grapefruit Papaya Mango Strawberries		Forms cementing substances, such as collagen, that hold body cells together, thus strengthening blood vessels, hastening healing of wounds and bones, and increasing resistance to infection	Aids utilization of iron
Thiamin (B_1)	Lean Pork Nuts Fortified Cereal Products	Aids in utilization of energy		Functions as part of a coenzyme to promote the utilization of carbohydrate Promotes normal appetite Contributes to normal functioning of nervous system
Riboflavin (B_2)	Liver Milk Yogurt Cottage Cheese	Aids in utilization of energy		Functions as part of a coenzyme in the production of energy within body cells Promotes healthy skin, eyes, and clear vision
Niacin	Liver Meat, Poultry, Fish Peanuts Fortified Cereal Products	Aids in utilization of energy		Functions as part of a coenzyme in fat synthesis, tissue respiration, and utilization of carbohydrate Promotes healthy skin, nerves, and digestive tract Aids digestion and fosters normal appetite
Calcium	Milk, Yogurt Cheese Sardines and Salmon with Bones Collard, Kale, Mustard, and Turnip Greens		Combines with other minerals within a protein framework to give structure and strength to bones and teeth	Assists in blood clotting Functions in normal muscle contraction and relaxation, and normal nerve transmission
Iron	Enriched Farina Prune Juice Liver Dried Beans and Peas Red Meat	Aids in utilization of energy	Combines with protein to form hemoglobin, the red substance in blood that carries oxygen to and carbon dioxide from the cells Prevents nutritional anemia and its accompanying fatigue Increases resistance to infection	Functions as part of enzymes involved in tissue respiration

Other Important Nutrients

Nutrient	Important Sources of Nutrient	Some major physiological functions
Vitamin D, The Sunlight Vitamin	Vitamin D Milk Fish liver oils Sunshine on skin (not a food)	Helps absorb calcium from the digestive tract and build calcium and phosphorus into bone
Vitamin E	Vegetable oils Green leafy vegetables Whole grain cereals Wheat germ Egg yolk, butter, milkfat	Protects vitamin A and unsaturated fatty acids from destruction by oxygen Exact biochemical mechanism by which it functions still unknown
Vitamin B_6	Beef liver, pork, ham Soybeans, lima beans Bananas Whole grain cereals	Assists in red blood cell regeneration Helps regulate the use of protein, fat, and carbohydrate
Folic Acid (Folacin)	Green, leafy vegetables Liver, dry legumes, nuts Whole grain cereals Some fruits, as oranges	Assists in normal blood formation Helps enzyme and other biochemical systems function
Vitamin B_{12}	Only in animal foods— Liver, meat, fish, shellfish Milk, milk products Eggs, poultry Vegetarian diets should include milk or a B_{12} supplement	Assists in the maintenance of nerve tissues and normal blood formation
Biotin (No RDA-NRC)	Kidney and liver Milk and eggs Most fresh vegetables	Helps regulate the use of carbohydrate Assists body in forming and using fatty acids
Pantothenic Acid (No RDA-NRC)	Liver, kidney, egg yolk Meat, milk Whole grain cereals, legumes	Helps regulate the use of carbohydrate, fat, and protein for the production of energy
Phosphorus	Milk and milk products Meat, poultry, fish, eggs Whole grain cereals Legumes	Combines with calcium to give bones and teeth strength Helps regulate many internal activities of the body
Iodine	Seafoods Iodized salt	Helps regulate the rate at which the body uses energy
Magnesium	Legumes, whole grain cereals Milk, meat, seafood Nuts, eggs Green vegetables	Helps regulate the use of carbohydrate and production of energy within the cells Helps nerves and muscles work
Zinc	Meat, liver, eggs, oysters Other seafoods, milk Whole grain cereals	Becomes part of several enzymes and insulin
Copper (No RDA-NRC)	Seafood, meat, eggs, legumes Whole grain cereals Nuts, raisins	Assists with iron storage and its release to form red blood cells

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From National Dairy Council

*B043 *Comparison Cards*—colorful bar-graph nutrient profiles of 57 popular foods, based on nutrient contributions to U.S. RDA.

B083 *Coronary Heart Disease: Risk Factors and the Diet Debate*—reviews risk factors associated with coronary heart disease; discusses components of the diet.

B122 *Dairy Council Digest*—bimonthly summaries of current nutrition research.

B018 *food and you . . . Partners in Growth during pregnancy*—influence of nutrients on the health of women and their babies, food sources of nutrients, a self-check sheet for evaluating dietary adequacy.

B005 *Food Before Six*—a digest of philosophy with suggestions for helping children, from one to six years, enjoy eating.

B205 *Food . . . from Birth to Birthday*—discusses breast and bottle feeding, introducing solid foods, weaning, and teething.

*B012A *Food Models*—146 full-color, life-size photographic models.

*P505 *Guide to Good Eating . . . A Recommended Daily Pattern*—full-color poster of the Four Food Groups and Others; "Nutrients for Health" chart on back. B164 Miniature, B164S Spanish Miniature.

B170 *Guide to Wise Food Choices*—nutrient information to aid consumers in making healthful food choices.

*S900 *Label It Nutrition*—multimedia, consumer education program for workshops on nutrition labeling.

B051 *Nutrition News*—quarterly nutrition research reports and innovative nutrition education programs.

B045 *Personalized Weight Control*—guidelines for losing or maintaining desirable weight.

*B007 *The Great Vitamin Mystery*—intriguing history of vitamin discoveries, roles of nutrients, and food experiments.

B028 *To Your Health . . . In your second fifty years*—(large type) Nutritionally sound food practices for advancing years.

*P507 *Your Snacks: Chance or Choice?*—full-color poster invites nutritional snack choices. B036 Miniature.

*Teacher/Leader Guide available which gives practical procedures for demonstrations and group activities on nutrients, food groups, planning meals and snacks, or using nutrition labeling as description indicates.

Nutrition Is . . .

Food, first of all—
yet much more.
It is the sum
of all the ways
our bodies use
the food we eat.

Nutrition, some say,
is a process,
a science, a state,
a study, a discipline—
depending on who
tries to define it.

Nutrition is
a complex marvel
of life-chemistry that
transforms food from meals
(yes, snacks too)
into living cells—into you.

Nutrition, too, is
people and meanings—
our food beliefs,
our customs, taboos,
notions, fears,
mold what our nutrition is.

Nutrition is
bound to life—
to health and hope,
to growth and healing,
to hunger and suffering,
to joy and vigor—
But always, to being alive.

—Eleanor Morrill Grimes

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